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ABSTRACT

This packet was designed to help teachers maximize a visit to a zoo's Africa exhibit. The packet provides two levels of activities, grades 3-5, and grades 6-8, for use before, during and after the visit. Activities are designed to enhance skills taught in science, social studies, language arts, reading, art, and math. A multi-grade background activities section is designed to have students learn about Africa by locating Africa on a world map, identifying the geography of the continent, and learning general facts about Africa. Activities for each grade level grouping are provided in five sections that cover the following topics: (1) geography of West, Central, and East Africa; (2) the rainforest and the savannah habitats; (3) animals and people of the African rainforests; (4) animal adaptations; and (5) awareness of environmental issues. Activities involve students in the use of research skills, oral and written communication, modeling, observing, classifying, analyzing, game-playing, and building vocabulary. A correlation of the activities to the Oregon Common Curriculum Goals in Science and Social Studies Activities is found in the teaching guide. The packet contains a 185-word glossary, a list of 188 African Studies resources, and 23 references. (LZ)

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# AFRICA

## A Social Studies and Science Curriculum.

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# TABLE OF CONTENTS

## AFRICA-TEACHER GUIDE

Table of Contents ........ II
Welcome to Africa ........ 1
Teachers' Guide
Packet Organization ........ 2
Visiting the Zoo
Parent Letter ........ 3
Why Study Africa? ........ 4
The African Savannah ........ 5
About Tropical Rainforests ........ 9
**BACKGROUND ACTIVITIES ........ 15**
Where in the World is Africa? ........ 16
Africa's Geography ........ 19
General Facts About Africa ........ 22
Touring the Africa Exhibit ........ 23

## 3RD-5TH GRADE STUDENT ACTIVITIES

*These activities can be adapted to other levels.

**THE LAY OF THE LAND ........ 29**
Countries of Africa Database ........ 30
Countries of West Africa ........ 37
Countries of Central Africa ........ 40
Countries of East Africa ........ 43
Countries of the Savannah and Rainforests ........ 46
Countries of the Savannah in Africa* ........ 49
African Country Question Map* ........ 53
**HOME SWEET HOME ........ 57**
Tropical Rain Forests: Earth's Living Treasures ........ 58
On the Savannah ........ 63
Wet and Dry* ........ 70
Africa's Rainforest ........ 73
Climate Comparison* ........ 76
Rainfall Habitats Puzzle ........ 78
A Day in My Life ........ 85
**A DIVERSE CAST OF PLAYERS ........ 87**
An African Tropical Rainforests' Who's Who* ........ 88
Sofli, Sofli Catch a Mongki* ........ 91
Folk Art of Africa* ........ 95

GET A LIFE! .......... 97
Herbivore, Carnivore, or Omnivore?* .......... 98
Food Web-A Tangled Mess* .......... 101
Bright Blue Ball* .......... 103
Savannah Hunt* .......... 107
Rain Forest Hunt* .......... 110
Rainforest Products .......... 113
CARING NOW FOR THE FUTURE OF LIFE .......... 117
Endangered Animals .......... 118
Africa Writing Activities .......... 120
Global Warming in a Jar* .......... 122
Sustained Use or Abuse? .......... 124
Help the Earth* .......... 126

## 6TH-8TH GRADE STUDENT ACTIVITIES

*These activities can be adapted to other levels.

THE LAY OF THE LAND .......... 129
Countries of Africa Database .......... 131
Countries of the Savannah and Rainforests .......... 139
Countries of the Savannah in West, Central, and East Africa .......... 142
African Country Portfolio .......... 144
HOME SWEET HOME .......... 147
Tropical Rain Forests: Earth's Living Treasures .......... 149
On the Savannah .......... 154
Tropical Savannah Climate .......... 161
Impala* .......... 165
Traditional Savannah Housing* .......... 170
Building a Biome .......... 173
Observing a Rainforest Storm* .......... 176
African Habitat Models* .......... 177
A DIVERSE CAST OF PLAYERS .......... 179
People of Africa Data Base* .......... 180
A Continent of Change .......... 184
African Folktales* .......... 187
African Masks* .......... 188
GET A LIFE! .......... 189
All That Rot* .......... 190
There's a Hole in the Canopy* .......... 192
The Building of a Pyramid* .......... 194
Mammals of the Savannah* .......... 197
It's All in the Bill* .......... 199
In the Cards* .......... 201
Made in the Jungle * .......... 205
Tropical Savannah Economy .......... 209

**CARING NOW FOR THE FUTURE OF LIFE .......................................213**
SOSoil ........................................................................214
Language Arts and Africa ....................................................219
Global Warming ...............................................................221
"The Heat is ON"-CO2 VS Air ................................................225
CO2 and You ..................................................................227
Sustained Use Living with Tropical Rain Forest ..............................230
Why Should We Care Now For The Future of Life ...............................235

**APPENDIX**

Oregon Science Common Curriculum Goals Correlation ....................A
Oregon Social Studies Common Curriculum Goals Correlation ...........B
Africa: Glossary ..............................................................C
Africa: Resources .............................................................I
Africa: Bibliography ..........................................................K

# AFRICA

## INTRODUCTION

## WELCOME TO AFRICA !

The Washington Park Zoo is a wonderful place where children can understand and appreciate wildlife and people of the world around them. The Zoo's Africa Exhibit includes wildlife from the savannahs and rainforests of Africa. Students can benefit from learning about the culture and environment of the people of the world.

## TEACHER GUIDE

To help maximize your zoo visit, this packet is designed to provide two levels of activities, 3rd-5th grade and 6th-8th grade, which you can select from for use before, during, and after your visit to the zoo. This packet is unique in that it provides an integration between science and social studies. Activities are designed to enhance the skills you teach in a variety of subject areas, including science, social studies, language arts, reading, art, and math. More activities are included than can possibly be accomplished in a single visit to the zoo. Suggestions for core activities and enrichment are provided. A correlation of the activities to the Oregon Common Curriculum Goals (CCG's) in Science and Social Studies are listed in the "Teacher Information" section of the activities and in the appendix to this guide.

# PACKET ORGANIZATION

This packet is organized into four parts:

TEACHER'S GUIDE a resource to help you use the packet with your students. (You are reading that part right now.)

BACKGROUND ACTIVITIES, MULTILEVEL a set of introductory materials designed to be used with students in grades 3 - 8 and in combination with one of the following sets of grade level specific activities.

ACTIVITIES FOR GRADES 3 - 5

ACTIVITIES FOR GRADES 6 - 8

The last two parts are each divided into five topic sections. Combining these with multi-level background activities provides the teacher with six sections of activities. Each activity includes background information, goals and objectives, instructions for activities, and student handouts (for you to reproduce). The packet includes school based activities, ones to be completed at the Africa Exhibit, and post field-trip activities. Many of the activities at one level can be adapted for use at the other level. These activities are marked with an asterisk (*) in the table of contents.

The six sections are described below:

◎ The BACKGROUND ACTIVITIES section is designed to have students learn about Africa by locating Africa on a world map, identifying the geography of the continent, and learning general facts about Africa. The final activity in this section is to be completed while touring the Africa Exhibit at the Zoo.

☼ The LAY OF THE LAND has many activities to choose from including identifying countries in West, Central, and East Africa, and knowing which countries are located in the rainforest or savannah habitats. In addition to using resource maps, students will use a database of information about countries in Africa to understand the lay of the land of Africa. The final activity asks students to identify the questions that they have about the countries in these three habitats. Students will need to use research skills and develop oral or written reports of their findings.

△ HOME, SWEET HOME focuses on the characteristics of the rainforest and the savannah habitats. These activities are designed to increase the students' awareness of the climate of the regions. At the zoo, students are asked to decribe the habitats of one of the regions by decribing a day in the life of an African animal.

● A DIVERSE CAST OF PLAYERS gives students an opportunity to learn more about the animals and people of the African rainforest and savannah regions. Science skills of observation and classification are emphasized. Students also get a glimpse of the culture of the people by learning about proverbs and art forms of Africa.

◈ GET A LIFE! helps students understand how animals live in and adapt to their environment. This section includes information about the natural resources that are found in Africa. Students begin to understand the inter-relationship of Africa and America by analyzing their use of products from Africa.

◆ CARING NOW FOR THE FUTURE OF LIFE is designed to show students that they can shape the future by their actions today. Through these activities, students will gain an increased awareness of environmental issues related to the air, land, and water. It is our hope that students will learn to become better caretakers of the earth.

# VISITING THE ZOO

To ensure the best learning experience, the zoo requires **one** chaperone per **five** students for schools visiting under education group rates. Chaperones guide students through the zoo and can assist them in completing activities at the Africa Exhibit. Included in this section you will find a sample letter to parents to inform them of your field trip, and invite them to serve as chaperones.

## SAMPLE LETTER TO PARENTS

**(School Letterhead)**

Date

Dear Parent,

On (date), our class will be visiting the Metro Washington Park Zoo on a school-sponsored field trip. Over the next several weeks, we will be learning about the animals and people of the African Savannah and Rainforest. While the emphasis of our studies is on science and social studies, we have many exciting activities planned for reading, writing, math and art. You can help by encouraging your students to share what they are learning about Africa and to conduct further research on topics of interest.

Although we always hope for beautiful weather, please be sure to have your child dress in appropriate clothing for possible changes in the weather while we're at the Zoo. Your child will need to bring a sack lunch and a backpack on the field trip day.

Before any student can be released from school, parent permission must be provided. Please sign the enclosed field trip permission slip and return it to school with your child before (date).

You are invited to join us on the field trip as a chaperone. The zoo requires a ratio of one adult chaperone for every five students, and your help would be most appreciated. You will be provided with a chaperones' guide to the Africa Exhibit. If you would like to serve as a chaperone, check the appropriate statement on the enclosed permission slip. If you have any questions, please call me at (phone #).

Sincerely,

(Name)
Teacher, (School)

---

(student's name)________________________, has my permission to travel by (bus or private car) to the Metro Washington Park Zoo on (date).

__ I would like to serve as a chaperone for the Zoo field-trip on (date).
__ I am not able to serve as a chaperone for the Zoo field-trip on (date).

(Parent's signature) Date: Phone:

# WHY STUDY AFRICA?

Africa is a continent that lies on the equator in the eastern hemisphere of the world. It is a land that is known for diversity of geographical formations, climates, animals, people, and products. Africa's savannah and rainforest regions house many animals, plants, and people that improve our lives in America.

Through the study of Africa's savannah and rainforest regions, students can learn about this important land and how it relates to their lives today. Many products from Africa are used daily in America, therefore students should learn about related environmental issues found in Africa. The people of Africa, including their culture, customs, politics, and economics, can show students how civilizations work, play, and change over time.

Through a complete study of Africa, students can learn about how they are related to the people and wildlife of Africa. Knowledge of these regions can help make students more informed decision-makers, and better care-takers of their environment.

# THE AFRICAN SAVANNAH

The African Savannah is comprised of numerous related habitats, covering vast stretches of Sub-Saharan Africa. It is host to the world's greatest diversity of mammalian herbivores, including over 70 species of antelope. These, in turn, support a less numerous, yet incredibly adapted diversity of predators and scavengers. Savannah is ecologically simple when compared with tropical rainforest. There are far fewer species but typically in far greater numbers. The country is mostly open, with rainy and dry seasons, each lasting nearly six months. Drought is a recurrent threat, and life is generally adapted to prolonged exposure to hot sun, wind, and rain. Temperatures often range from 100 degrees Fahrenheit by day, to near freezing at night. The dry season, periodically compounded by prolonged drought, makes the dry savannah grasses and woodlands susceptible to fire.

## ABOUT THE LAND

Fire is an integral, cyclic part of the ecology of the savannah. Natural fires rid the land of accumulated stubble, branches, and add a fine layer of fertile ash to the soil. Many plants have adapted to fire to the extent that they depend on it to complete their life cycles. Seeds that are stimulated to germinate by fire have several advantages over others. They are deposited on burned, fertilized, bare soil instead of a thicket of grass. Competition is minimal, as dead plants are cleared away. Seeds of shade-intolerant species may find room to grow in after a fire.

"Secondary grasslands" are those that have been conditioned by human-introduced fires. For many centuries pastoral peoples of the savannah have set fires to clear the savannah for new growth. This practice favors the expansion of grassland over that of woodland, thereby increasing forage for cattle, and for wild grazers as well. In fact, this human intervention has historically enabled herds of grazers to grow as huge as they have been, for the natural balance of the savannah originally supported fewer grasslands. The process has reversed itself in national parks, where fire has been fastidiously prevented for decades. Slowly, but measurably, woodland has expanded at the expense of grasses, tilting the dinner table to the advantage of browsers.

## WATER

Water is a major limiting factor on the savannah. While some animals are adapted to obtaining and conserving water from the vegetation they eat, others require permanent sources for drinking and habitat. The savannah is spotted with shallow, freshwater lakes in drainage basins and/or at spring sources. Some are permanent, others are seasonal, and all fluctuate with precipitation. Many wetland swamps exist well into or through the dry season. Their standing water prevents the fire from burning off excess vegetation, which creates a dense mat of undecomposed organic debris. This mat, in turn, protects the soil below it from drying. The savannah's standing water supply contracts in the dry season, and especially in drought, when huge numbers of animals congregate at the water. While the savannah is not capable of supporting a great diversity of amphibians or fish, it is an ideal habitat for mammals, birds, reptiles, and insects.

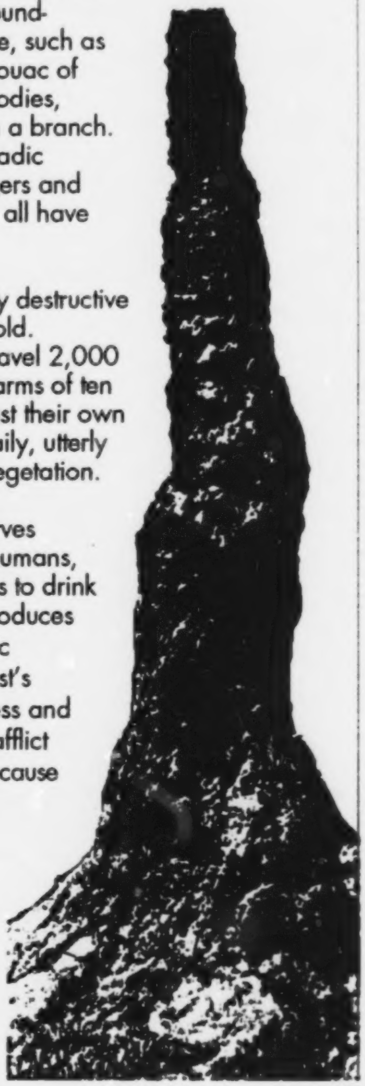
## INSECTS

In temperate soils it is the earthworm that conditions the topsoil, tunneling, aerating, digesting organic matter, and depositing fertile castings, and mixing layers of soil to effect a better overall composition. Air, water, animals and plant roots gain easier access to the soil because of the worm's work. The savannah is too dry for most worms, but their job is accomplished largely by insects, especially termites and ants.

African mound termites build colonial homes by sculpting mud into fabulously intricate and sturdy shapes. The egg-laying queen and her mate live permanently enclosed in a royal cell, deep in the mound's interior. Millions of termites may live in a mature colony. They eat plant fibers, digesting cellulose with the assistance of symbiotic protozoans in their intestines, and with a fungus they farm underground. The protozoans will die if their temperature fluctuates by as much as several degrees, so termites build ventilating chimneys up to 30 feet tall and dig up to 50 feet to the water table. They then bring bellies full of water up to the chimneys and moisten their walls. The cooling of evaporation does the trick. The colony's temperature varies by about 1 degree Celsius throughout the year.

After a queen's death, a colony slowly dies out, with no new young to carry on. But the mound becomes a fertile oasis. Years of aeration, fungus farming, termite life and death, and unknown tons of cellulose have made the ground here a nutrient island. Mound sites frequently become home to trees, or higher concentrations of plant life after abandonment.

Ground-nesting ants have the same effect, although less pronounced than that of termites. Most savannah ant colonies number in the hundreds, whereas termite colonies contain millions. Many are ground-dwellers, although some, such as soldier ants, form a bivouac of their own interlocked bodies, usually suspended from a branch. There are hunters, nomadic hunters, harvester-foragers and social parasites, nearly all have nasty bites.

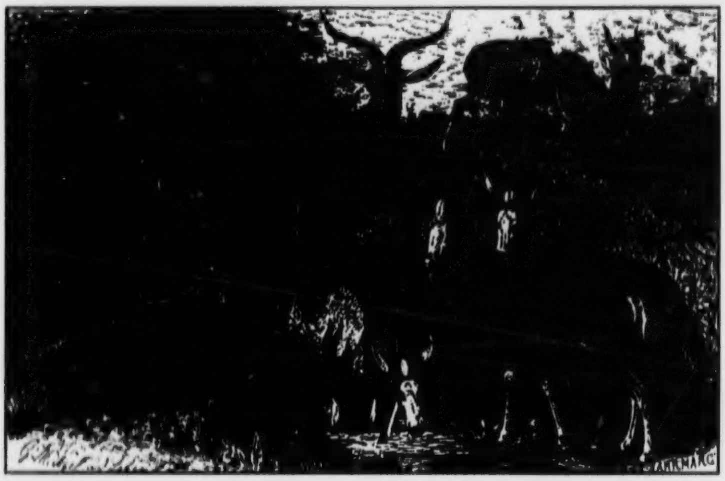


Locust, are an extremely destructive biological force to behold. Unchecked, they can travel 2,000 miles per season in swarms of ten million. They eat at least their own body weight in food daily, utterly denuding the land of vegetation.

The tsetse fly also deserves mention here. It bites humans, cattle and other animals to drink blood, and thereby introduces Trypanosomes (parasitic protozoans) into the host's blood. Sleeping sickness and other related diseases afflict both man and beast because of the tsetse.

Mosquitoes spread parasitic protozoans that cause malaria. This disease is really of several varieties ranging in severity and responsiveness to treatment. The control of this disease is truly a race between medicine and mutation, as new strains of malaria periodically emerge.

Insects play a huge role in the savannah food webs. A great number of animals are insectivorous at least on an opportunistic basis. Nearly everything eats termite alates, including people, and others are highly specialized to the task, such as the aardwolf and aardvark.
The entire ecosystem would eventually collapse in their absence.



## HERDS

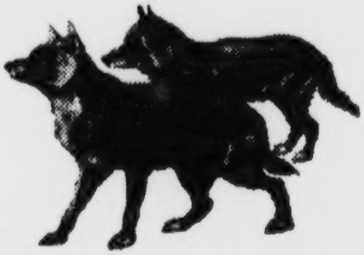
One thing must be said of savannah animals. They are creatures of speed and endurance. The savannah selects these traits by providing few hiding places, vast flat expanses, great traverses between waterholes and migratory destinations, and fast predators. Zebras, gazelles and giraffe are among the heartiest, but even elephants can travel many miles by night in search of food and water.

Most of the large herbivores are gregarious, often travelling in herds, and often congregating to feed or drink in massive, mixed herds. Some commensal behaviors result, such as the ostrich's inadvertent warning of the other grazers that predators are approaching. The odds of surviving predation also increase,with large numbersof animals. But most amazing is the sheer mass of life supported in such concentration. It would seem that competition would create conflict and scarcity, and it would, if it occurred.

Africa's long periods of geologic and climatic stability have allowed a great deal of specialization to evolve among the herbivorous herds of the savannah. Within one grassland exist many distinct niches, and each species seeks out its own preferred forage, although generalizing in times of scarcity. Some herds are physically together, yet ecologically somewhat separated. The following are common examples:

1. Species are separated by broad habitat preference.
2. Some species prefer the same food but occupy different habitats (wildebeest and buffalo).
3. Some species prefer the same plants, in the same habitat, but at different times of year (Grant's gazelle and wildebeest).
4. Some species are separated by vertical stratification of forage (giraffe and black rhinoceros).
5. Some species move to separate dry season habitats during the dry season, just when competition would have peaked otherwise.
6. Some species eat different parts of the same plant, or eat from it at different stages of growth.
7. Generally, grazers prefer grasses and browsers prefer leafy forage.

Gazelles offer a classic example of this multi-species forage concept. They stay away from the large mixed herds that congregate in wet areas during the dry season. The gazelles stay in areas too dry for other animals, eating their preferred short, crisp grasses. When the rains come, these grasses grow beyond the taste preference of the gazelles, but can now support the larger animals of the mixed herds. The mixed herds have already trampled and short-cropped the wetland grasses, and need to move out to find new forage. The gazelles move in and graze the short-cropped leftovers. In this case habitats are seasonally mutually exclusive with respect to these animals, avoiding competition.



## PREDATORS AND SCAVENGERS

Some savannah predators also display great speed, endurance and agility. Lions perhaps, but especially fast are the cheetah, the serval and the caracal, the latter two more noted for agility, the cheetah for raw speed. Thus predator and prey continue to coevolve. Lesser known mammalian predators include hyenas, jackals, wild dogs and numerous others. Nearly all of the reptiles of the savannah are predatory, such as the spitting cobra and the savannah monitor. Predatory birds abound near water, feeding on small invertebrates, amphibians, and fish. Examples include malachite kingfishers, helmeted guinea fowl, the African white spoonbill, and the shoebill.

Scavengers of the savannah include the marabou stork, spotted and striped hyenas, jackals, wild dogs, and other animals. Yet one study of 1,052 spotted hyenas observed eating at night found that 82% were eating their own kills, 11% were eating another animal's kill, and 7% were uncertain. By day, however, 34% were observed eating other predator's kills. It is easy to see how we have believed the spotted hyena to be a scavenger in a pure sense, when in fact it is the number one predator of the savannah in total number of kills. Many apparent lion kills are actually meals pirated away from hyenas, which makes lions scavengers!

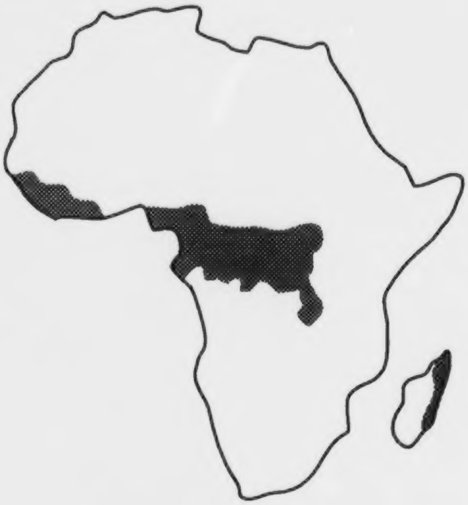
## THE THREAT

Savannah wildlife face multiple threats, including poaching, habitat loss, overgrazing, and erosion. Greed, ignorance, superstition, and cultural tradition combine to make poaching a lucrative trade. Black rhino horns, spotted furs, ivory, trophies, and the list goes on and on. Species are selected for extinction by black market forces .

But the land itself is increasingly at risk. An all too familiar scenario in many tropical nations involves cattle, herbivorous wildlife, and termites. As more land is grazed in cattle, wild animals increasingly fall short of adequate forage and die, or compete with cattle for food. Some ranchers simply overgraze the land. Either way, the soil is trampled and denuded, ripe for quick gully erosion in the tropical rains. Enter termites, who have helped defoliate this land. Their alates enjoy greater success in burrowing to begin new colonies, because the bare soil is more accessible, and because the cattle have displaced most of their predators. This precipitates a termite population explosion that ensures a shortage of groundcover. Farms, ranches and many attempted tree plantations have all wound up in the belly of the termite. Termite populations are exploding worldwide as a consequence of such ecological disruption. In such great numbers, the methane gas they release as a byproduct of cellulose digestion is actually a significant contribution to global warming! Clearly erosion control and sustainable grazing methods must be employed to effect a more efficient land use, for people and for wildlife.

# ABOUT TROPICAL RAINFORESTS

A quick glance at the map below will show you where the tropical rainforests of the world are located. Africa's tropical rainforests are found banded across West and Central Africa, on Madagascar and on the Comoros Islands. But what distinguishes these from other kinds of forests?

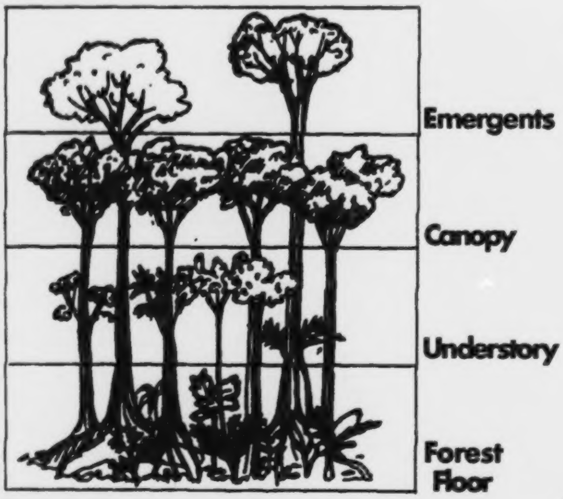


## TROPICAL RAINFORESTS ARE...

1. Tropical! Located near the equator, and between the Tropics of Cancer and Capricorn.
2. Rainforests. At least 80 inches annual precipitation must fall, the average being 93 inches, and the record well over 400 inches. Rains are intense, but brief, and typically late afternoon occurrences.
3. Wet year-round. At least 4 inches of rain must fall per month, even during the driest months, in 2 of every 3 years. If a dry season is drier than this, this transitional habitat is probably a tropical seasonal forest.
4. Low in elevation. Mangroves, coastal forests and inland lowland forests are considered tropical rainforests. Cloud and **montane** forests grow at high elevations, moistened by fog, mist and rain. They are cooler, shorter, and more dense.
5. Hot and humid all year. Temperatures usually range between 70-85 degrees, fahrenheit changing very little from day to day, day to night, or through the year. Day length varies as much as an hour through indistinct seasons. The equatorial angle of exposure to the sun is direct, and somewhat uniform all year. Rainy and dry seasons don't vary greatly. Humidity averages 70% by day and 95% at night, with many days of saturation. The year is really one long, fantastic growing season.

## LIVING ARRANGEMENTS

The life of the tropical rainforest has adapted to existence in zones or layers of varying height above the ground, and in response to other conditions that vary with height. These layers are broadly termed emergent, canopy, understory, and forest floor.



## THE EMERGENTS

Two or three emergent trees protrude well above the canopy per acre of rainforest. Emergents have ranged from 150-250 feet in height, with huge trunks that begin to branch above the canopy. The trees have a great need of support due to their size and exposure to wind, but soils are too shallow for much deep rooting. They have adapted with huge buttress roots that stand ten or more feet tall and fan radially many feet from the trunk. In the tree tops, life is subject to increased solar radiation, wind and heavy rain. Many animals will visit the emergents but few take residence there. They are usually light-weight creatures adapted to flight, leaping, brachiation and general agility, such as monkeys, eagles and others. The trees are often wind-pollinated, with narrow evergreen leaves adapted to conserve water. Seed dispersal is also often wind-driven, for the wind is a significant selective force at these heights.

## THE CANOPY

Most rainforest life is in the canopy. This unbroken carpet of dense foliage is only intermittently broken with emergents or edge created by waterways. It ranges from 65-100 feet tall, with the actual foliage averaging 20 feet deep. Very little branching is observed below the canopy. The canopy absorbs or blocks over 95% of sunlight received, softens the rains before they reach the ground, and completely shelters the understory from wind. Most plants and animals, including an estimated 80% of the forest's food, are found in the canopy. The trees are evergreen broadleafs adapted to shed water with drip-tipped leaves that are smooth and shiny. If water collected on the leaves, the weight of it plus mosses and algae that would grow there would bring the trees down.

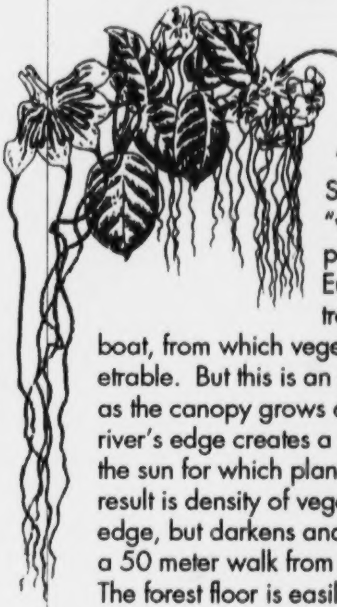
The trees of the canopy provide a framework of microhabitats for myriad varieties of plants and animals. Lianas, other vines, and climbing plants use the canopy as a trellis; dependent on the trees to reach the sunlight high above the ground. Thousands of species of epiphytes (plants that grow on other plants and whose roots do not grow down to the soil for nutrients) are adapted to a range of conditions the canopy affords, with available light acting as a primary limiting factor. Many epiphytes are adapted to conserve water. Many epiphytes actually collect and pool water with container-like structuring. These pools serve as microhabitats that support entire food webs. Some, as in the case of the pitcher plant, serve to trap insects, which are then digested for much-needed nutrients. But all of the pools store available water, which adds great weight to the trees. Some trees have adapted to this stress by periodically shedding bark, along with plants attached to it. Some exude chemicals to prevent the seeding of the branches. Half of the canopy's nutrients are epiphytic.

## THE UNDERSTORY

The understory seldom exceeds 15 feet in height, with widely dispersed small trees and shrubs with elongated crowns. These plants are adapted to extremely filtered light (95%), with very large leaves. Some are lifelong shade tolerants, carrying out complete life cycles in this zone. Others are offspring of canopy or emergent species, and incapable of reproducing without maturing high above in the unfiltered light. Yet these are often adapted to "wait" for space to open in the canopy, surviving many years as temporary shade tolerants, but eventually dying if they can't compete for canopy space. Understory air is extremely humid and still, which is ideal for decomposers but poor for wind pollination. Few herbaceous plants are found here. In the dark calm, flowers must rely on brightness, visual contrast and odor to attract animal pollinators such as birds, bats, and insects.

Animals of the canopy and understory are adapted to life high above ground, equipped with wings, strong and long arms, long fingers, strong hands, opposing toes, prehensile tails, hooked claws, suction cups, gliding skin flaps and a wide range of behavioral adaptations to employ these structures in complex arboreal locomotion.

The large herbivores of the plains are not the norm here, nor are the large predators, for large size is maladaptive to sustained tree living. Food-bearing branches typically aren't capable of supporting great masses. There are millions of insect species living in the canopies of the world's rainforests, and many thousands of other invertebrate species as well. Most vertebrates are small to medium-sized and largely herbivorous, though technically omnivorous. Most monkeys, for example, eat mainly plants, but will also eat insects, eggs, and small vertebrates opportunistically.



## THE FOREST FLOOR

"Jungle" comes from "jangala", an ancient Sanskrit word describing "vegetation too dense to penetrate." Most early European exploration of tropical rainforests was by boat, from which vegetation did appear impenetrable. But this is an edge phenomenon. Much as the canopy grows dense to compete for light, a river's edge creates a rare angle of exposure to the sun for which plants vigorously compete. The result is density of vegetation that is extreme on the edge, but darkens and opens dramatically within a 50 meter walk from the water into the forest. The forest floor is easily walked through.

One is surrounded by cathedral-like tree trunks that rise to the canopy without branching, and supported by buttress or stilt roots. Understory species rise intermittently, in low density. Herbs are not common. The soil is mostly bare. Conditions here favor decomposition - warm, moist, stiflingly constant. Bacteria and fungi thrive here. Only large trees remain recognizable two weeks after death. Animals, leaves, shrubs, branches, and other organisms are consumed and reconsumed rapidly by higher animals and decomposers, finally to be absorbed by omnipresent roots into the canopy. Cuts, scratches or other wounds are easily infected here, and healing is incredibly slow due to a proliferation of microbes. It is truly a testing ground for resistance to infection.

## DIVERSITY

The earth's tropical rainforests are tens of millions of years old, having survived and adapted to a series of major tectonic events and climatic changes. This long history of ideal growing conditions and change allowed for rampant speciation. Diversity is the rule of life here. In one rainforest over 42,000 different kinds of insects, 750 species of trees and 1,500 species of other higher plants were found in one hectare! One square yard of another tropical rainforest yielded over 800 ants of 50 species. And yet on such a plot it might take hours to find two trees of the same species. There is amazing diversity, but there are relatively few of any one species in the rainforest.

This is in total contrast to the savannah, with its huge herds of a relatively few total number of species, and it contrasts sharply with the biomes of North America, Europe and most of the world's industrialized nations, which are also lacking such diversity. This may in part explain our persistent application of temperate utilization techniques (that often fail miserably) and our relative inability to sustain maximum productivity in a highly diverse, highly productive, highly interdependent environment. We don't live in one. And western cultures are only beginning to show an appreciation for the ecology of their own lands.

## THE FAILURE OF TEMPERATE LAND-USE STRATEGIES

Extensive monocultural farming and cattle ranching are mainstay food production techniques in temperate zones, but they fail and destroy rainforests in most cases. When settlers log, clear, and burn the forest, they release nearly all of its nutrients immediately into the air and ash. Poor, acid, shallow soils are exposed to heavy tropical rains, which leach nutrients out and literally erode the land away, rendering it useless to cattle or farming in 2 or 3 years. The settler moves on to clear virgin forest and repeat the devastation. The scarred lands heal slowly, if at all, with secondary forest that is utterly lacking in diversity and does not recover its primary richness.

Most tropical nations export massive amounts of eroded soil down their rivers due to deforestation.

Other extensive farming or plantation schemes have failed because the complex interdependence of the rainforest was ignored. To isolate a uniform stand of many fruit-bearing trees is impossible because such trees require other plants and animals in specific relationships to carry out pollination, seed dispersal and other processes. Pollinators must also have their habitat needs met, and if they are ignored, pollination will not occur. Most pollinators are species-specific, as are most relationships in the rainforest. Monocultures are also extremely susceptible to disease and pestilence, as the population is gathered in a concentrated area that has largely been rid of its pest predators. Rubber and Brazil nut plantations failed for these and other reasons.

Tropical rainforests are the most productive terrestrial environments on earth, producing more pounds of life per given area than anywhere else. They contain 80% of all land vegetation. The growing season is permanent. It seems incredible that one hectare of tropical rainforest can support many tons of vegetation and at least hundreds of pounds of animal life. Yet when burned and cleared for cattle, that same hectare will yield about 9 pounds of beef per year, until the soil is exhausted in several years. We must learn to maximize sustained use productivity in the rainforest, for the rainforest and its peoples.

## TREASURES YET UNKNOWN

Tropical rainforests cover only 7% of the earth's surface, but account for more than 50% of all plant and animal species. They are yet-to-be explored libraries of raw genetic material. Timber, pulp, fuel wood, oils, resins, fibers, nuts, fruit, vegetables, spices, dyes, tanning agents, rubber, chicle (gum base), honey, and medicines all come from rainforests. Many more products will follow, as by far most of the rainforest's bounty has yet to be discovered. One fourth of all drugstore medicine purchases are drugs derived from rainforest plants. Over 1,400 species of rainforest plants are believed to have anti-cancer properties, but less than 1% of all tropical rainforest plants have even been screened for medicinal properties. Most of earth's people depend on less than a dozen plant species to provide food staples, making our food supplies extremely susceptible to disease and pestilence. Tropical rainforests contain hearty gene stocks of species with which to hybridize and strengthen currently used crop species. The rainforests also offer a diversity that is less susceptible to disease or pests, a concept that offers us much potential benefit.

## IT'S HAPPENING RIGHT NOW!

Some scientists have estimated that up to 30 million species exist in the world's tropical rainforests; up to 90% of the earth's total diversity. Yet from 1940-1990 40% of these forests were destroyed. They're disappearing fast, and the rate of destruction is increasing rapidly. Every minute of every day 57 acres of rainforest are cut. 19 million rainforest trees are felled every day. 46,500 square miles of rainforest are destroyed every year. An area the size of Nepal. Five tropical rainforest species per day become extinct, and in several years the pace will accelerate to one species per hour. By the year 2,000, civilization will have disrupted the last truly primeval human cultures, and over one million species will be extinct. We still don't even know 10% of the species of life on our planet.

Finally, the loss of tropical rainforests, coupled with global warming from the greenhouse effect forbodes a truly disastrous scenario. Our cars, homes, and factories account for over two-thirds of our atmosphere's excess carbon dioxide, while the burning of tropical rainforests does not yet account for a full third of it. We are faced with predictions of rising temperatures, climate changes, desertification of semi-arid regions, melting ice caps, rising sea levels and flooded coastlines (heavily inhabited), and falling agricultural production because this gas (and a few others) is causing our atmosphere to retain heat longer than before. As much as we must save the tropical rainforests to absorb atmospheric carbon dioxide, we must plant forests here at home to do the same. Above all else, we must cut down our use of fossil fuels and drastically reduce carbon dioxide emissions here at home. Global problems require global solutions, sacrifices, and cooperation. We all need to get involved for our own good!

# BACKGROUND ACTIVITIES

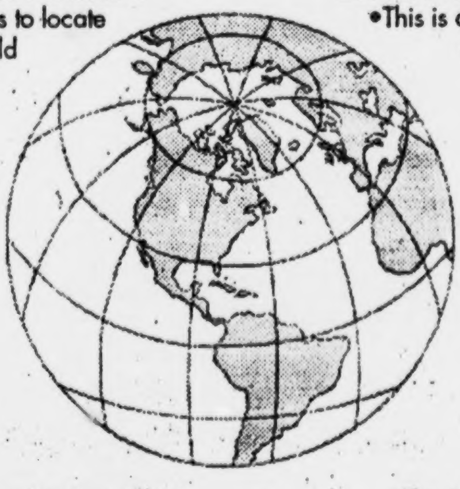
# MULTI-LEVEL

The BACKGROUND ACTIVITIES section is designed to have students learn about Africa by locating Africa on a world map, identifying the geography of the continent, and learning general facts about Africa. The final activity in this section is to be completed while touring the Africa Exhibit at the Zoo.

The activities are general in nature and can be adapted for different levels depending on the focus of instruction and the ability level of your students. The activities are described below:

WHERE IN THE WORLD IS AFRICA?
- This activity uses mapping skills to locate the continent of Africa on a world map.

GENERAL FACTS ABOUT AFRICA
- This is an activity that can be read by students or incorporated in an inquiry or research project.

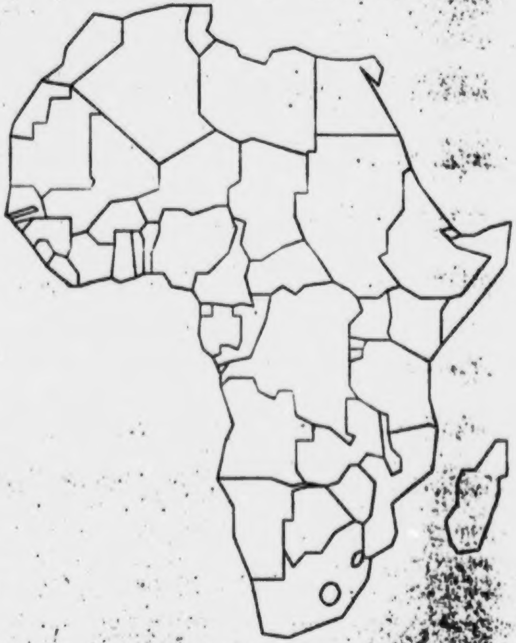


THE GEOGRAPHY OF AFRICA
- Students learn about the geographic features of Africa while using resources such as globes, maps, and encyclopedias.

TOURING THE AFRICA EXHIBIT
- This is an opportunity for students to map their journey through the Africa exhibit.

# WHERE IN THE WORLD IS AFRICA?

## Teacher Information



### ACTIVITY OBJECTIVE:

Students will be able to locate the continent of Africa on a world map, using longitude, latitude, the Prime Meridian, and the Equator.

SOCIAL STUDIES CCG'S: 3.1, 3.5, 6.1, 6.2, 6.3, 7.2, 8.1.

### VOCABULARY:

- equator
- longitude
- prime meridian
- latitude

### MATERIALS:

- Maps of the world.
- Copies of the student directions for **"Where in the World is Africa?"**

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Show students how to locate the equator and prime meridian on a world map.
- Review the continents and their location on a world map.
- Have students work individually or in groups to complete the activity sheets using a world map.
- Have students share their answers and make corrections.

### ENRICHMENT:

- Locate other countries that lie near the equator.
- Locate Oregon using latitude and longitude.
- Have students make a map of Africa showing the equator.

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# WHERE IN THE WORLD IS AFRICA?

Answer each question using a map of the world and of Africa.

**1.** What continent lies to the north of the continent of Africa? ________

to the northeast? ____________
to the southeast? ____________
to the south? ____________
to the southwest? ____________
to the northwest? ____________

**2.** Through what six African countries does the equator pass?

____________ ____________ ____________
____________ ____________ ____________

**3.** Through what four African countries does the prime meridian pass?

____________ ____________
____________ ____________

**4.** Which is completely in the western longitudes - Senegal or Mali?________________________

**5.** Which is completely in the northern latitudes - Ethiopia or Kenya?________________________

**6.** Which is completely in the eastern longitudes - Ghana or Sudan?________________________

**7.** Which is completely in the southern latitudes - Zaire or Tanzania?________________________

**8.** Name the African country in which you would find each of these spots?

a. 10' N, 10' W ____________
b. 20' N, 10' E ____________
c. 10' S, 30' E ____________

# WHERE IN THE WORLD IS AFRICA?

## Answer Key

Answer each question using a map of the world and of Africa.

**1.** What continent lies to the north of the continent of Africa? *Europe*

| | |
|---|---|
| to the northeast? | *Asia* |
| to the southeast? | *Australia* |
| to the south? | *Antarctica* |
| to the southwest? | *South America* |
| to the northwest? | *North America* |

**2.** Through what six African countries does the equator pass?

*Gabon*
*Uganda*
*Congo*
*Kenya*
*Zaire*
*Somalia*

**3.** Through what four African countries does the prime meridian pass?

*Ghana*
*Faso*
*Mali*
*Algeria*

**4.** Which is completely in the western longitudes - Senegal or Mali? *Senegal*

**5.** Which is completely in the northern latitudes - Ethiopia or Kenya? *Ethiopia*

**6.** Which is completely in the eastern longitudes - Ghana or Sudan? *Sudan*

**7.** Which is completely in the southern latitudes - Zaire or Tanzania? *Tanzania*

**8.** Name the African country in which you would find each of these spots?

| | |
|---|---|
| a. 10' N, 10' W | *Guinea* |
| b. 20' N, 10' E | *Niger* |
| c. 10' S, 30' E | *Zambia* |

# AFRICA'S GEOGRAPHY

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate geographical features of Africa on a map.

SOCIAL STUDIES CCG'S: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### VOCABULARY:

- ocean
- gulf
- river
- channel
- mountain
- lake

### MATERIALS:

- Maps of the world.
- Copies of the outline map of Africa.
- Copies of the student directions for **"Africa's Geography."**

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Locate Africa on a world map.
- Have students work individually or in groups to complete the activity sheets using a map of Africa.
- Have students share their answers and make corrections.

### ENRICHMENT:

- Locate other geographical features of Africa.
- Have students make a relief map of Africa.
- Have students make a map of Africa on a bulletin board showing geographical features.
- Identify countries in which the named rivers, lakes, and mountains are located.
- Invite to students to find similar features on a map of Oregon and/or the United States.

# AFRICA'S GEOGRAPHY

Locate and label the following geographical features:

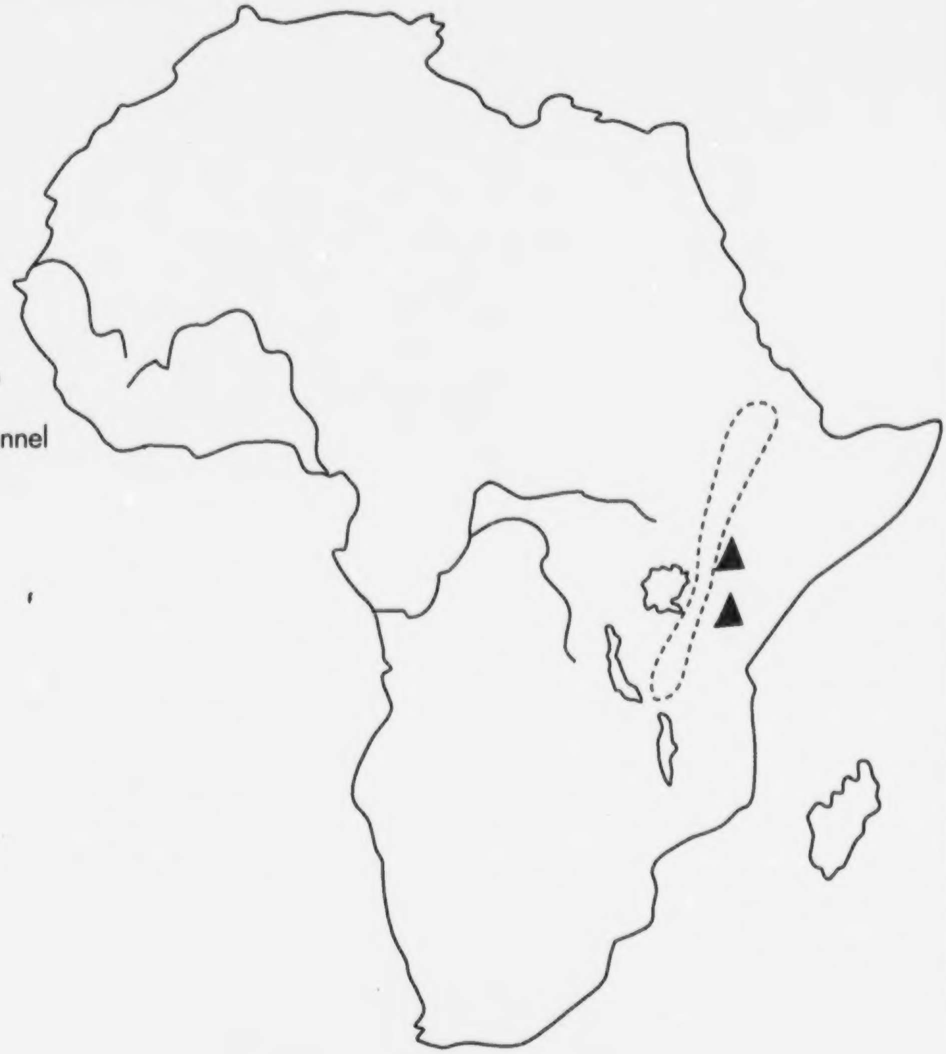
- Senegal River
- Niger River
- Ubangi River
- Zaire River

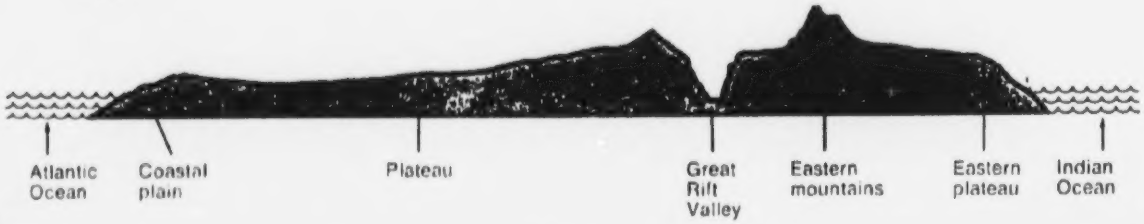
- Lake Albert
- Lake Victoria
- Lake Tanganyika
- Lake Malawi

- Mount Kenya
- Mount Kilimanjaro

- Mozambique Channel
- Indian Ocean
- Atlantic Ocean
- Gulf of Guinea

- Great Rift Valley




Atlantic Ocean
Coastal plain
Plateau
Great Rift Valley
Eastern mountains
Eastern plateau
Indian Ocean

# AFRICA'S GEOGRAPHY

## Answer Key

Locate and label the following geographical features:

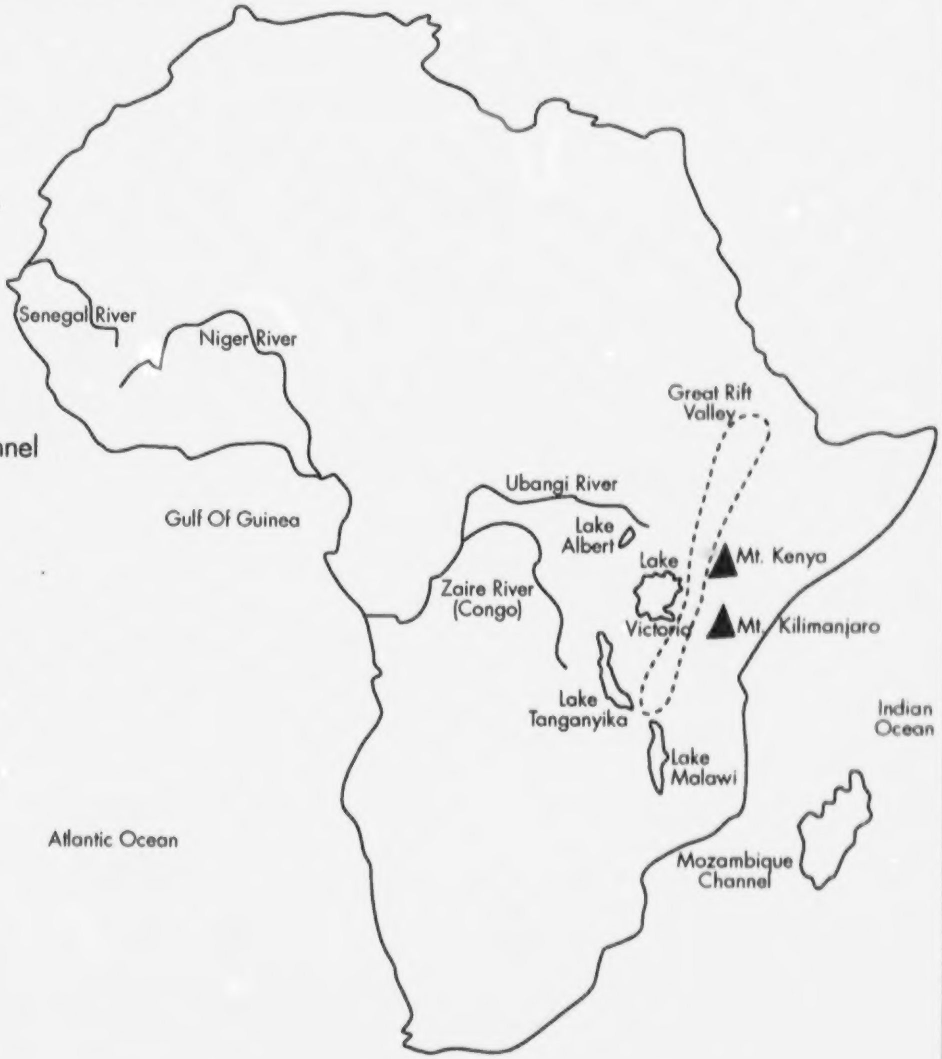
- Senegal River
- Niger River
- Ubangi River
- Zaire River

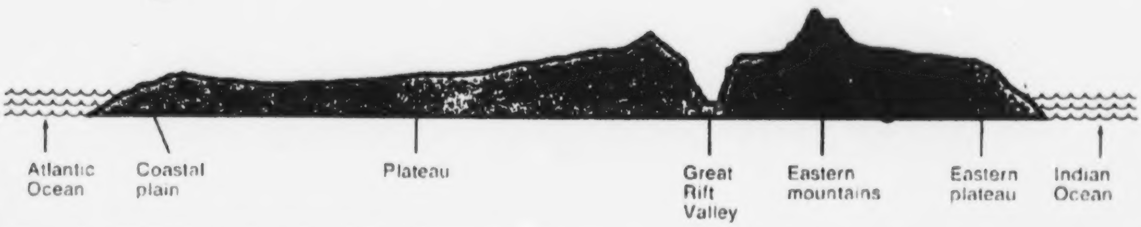
- Lake Albert
- Lake Victoria
- Lake Tanganyika
- Lake Malawi

- Mount Kenya
- Mount Kilimanjaro

- Mozambique Channel
- Indian Ocean
- Atlantic Ocean
- Gulf of Guinea

- Great Rift Valley


Senegal River
Niger River
Great Rift Valley
Ubangi River
Gulf Of Guinea
Lake Albert
Lake Victoria
Mt. Kenya
Zaire River (Congo)
Mt. Kilimanjaro
Lake Tanganyika
Indian Ocean
Lake Malawi
Atlantic Ocean
Mozambique Channel


Atlantic Ocean
Coastal plain
Plateau
Great Rift Valley
Eastern mountains
Eastern plateau
Indian Ocean

# GENERAL FACTS ABOUT AFRICA

SOCIAL STUDIES CCG'S: 3.1, 3.2, 3.3, 3.4, 3.5, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

1. Africa is the second largest continent in the world.
2. Mount Kilimanjaro in Tanzania is 19,340 feet high.
3. Most of Africa's 9 million square miles lies south of the Sahara Desert.
4. There are four primary types of habitat in Africa:
    a. Rainforests (a small area)
    b. Savannah or Grasslands (this covers nearly half of the continent of Africa)
    c. Desert (covers 1/3 of the continent)
    d. Mild coastal zones (located along the coastal countries in small bands)
5. Most of the African continent has two seasons: rainy and dry.
6. The Great Rift Valley is a deep valley that runs north and south through the countries of Ethiopia, Kenya, and Tanzania. Most of Africa's famous lakes are here. The source of the Nile River begins in one of these lakes.
7. All of Africa's major rivers are south of the Sahara Desert.
8. The people of Africa speak over a thousand languages.
9. 3/4 of Africa's people live in rural areas and 1/4 live in the cities.
10. Lake Tanganyika, located in the Great Rift Valley, is the second deepest lake in the world.

# TOURING THE AFRICA EXHIBIT

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify animals in each of the habitats of the African Exhibit.

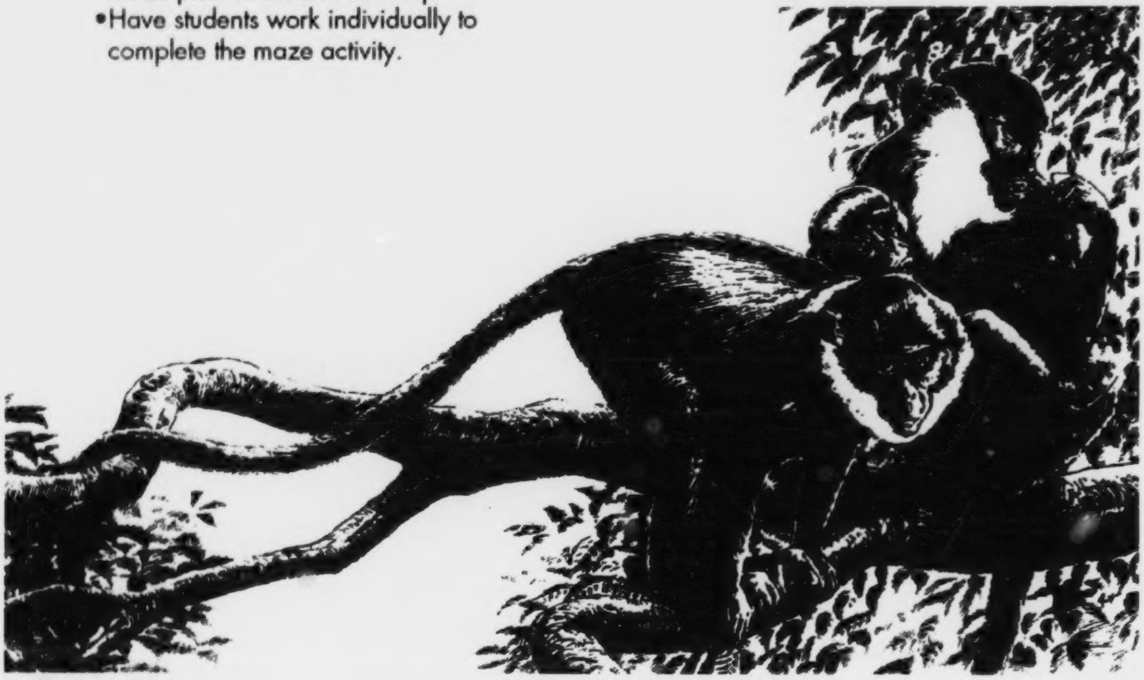
SOCIAL STUDIES CCG'S: 6.1, 6.2, 6.4, 7.1, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

- copies of the African Exhibit Maze.
- pencils/pens

### ACTIVITY DIRECTIONS:

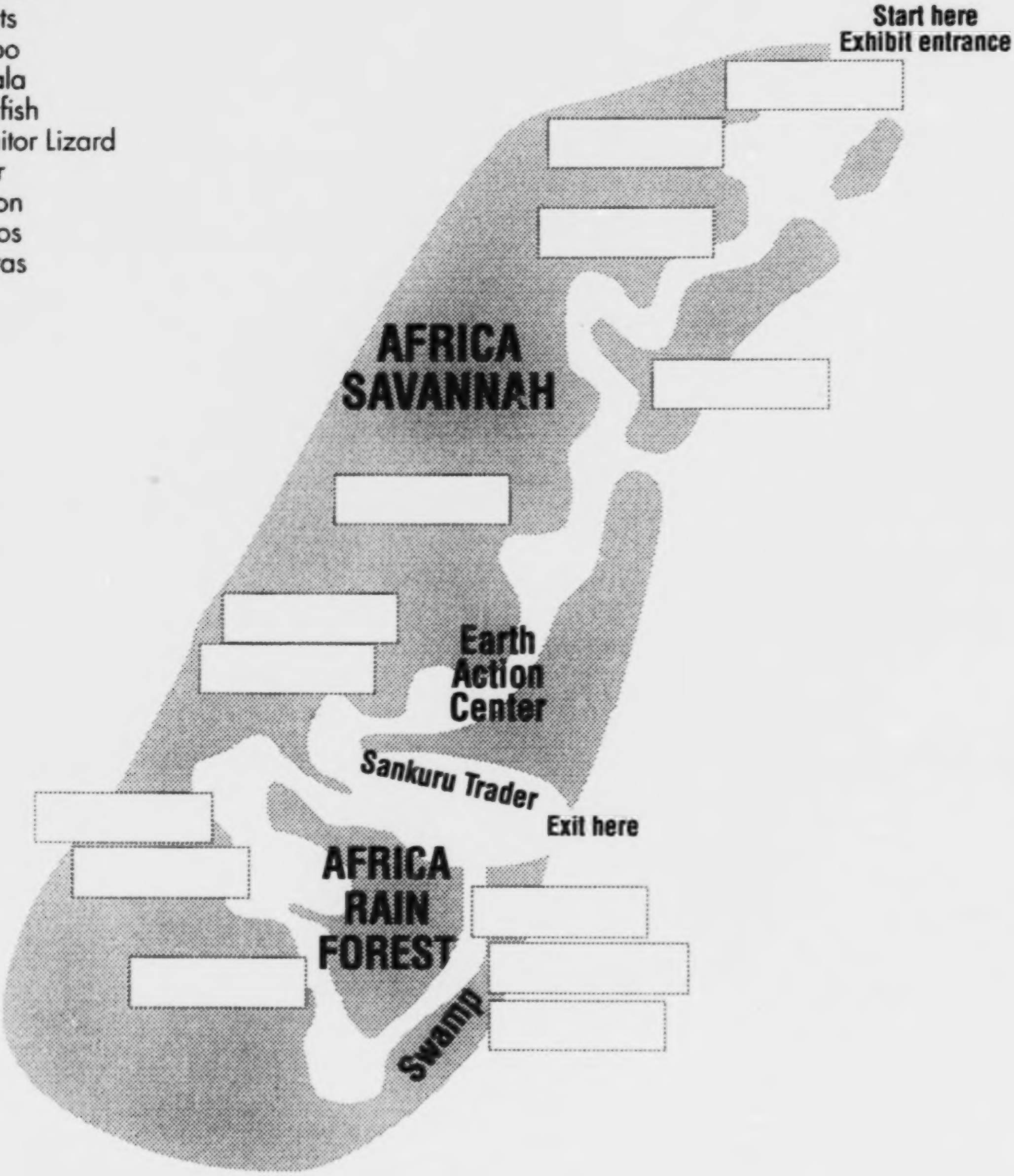
- Review the directions for completing the maze prior to the zoo field-trip.
- Have students work individually to complete the maze activity.



# TOURING THE AFRICA EXHIBIT

Locate and label the following animal exhibits in the Africa Exhibit while at the zoo.

- Aviary
- Bats
- Crocodile
- Giraffe
- Goats
- Hippo
- Impala
- Lungfish
- Monitor Lizard
- Otter
- Python
- Rhinos
- Zebras

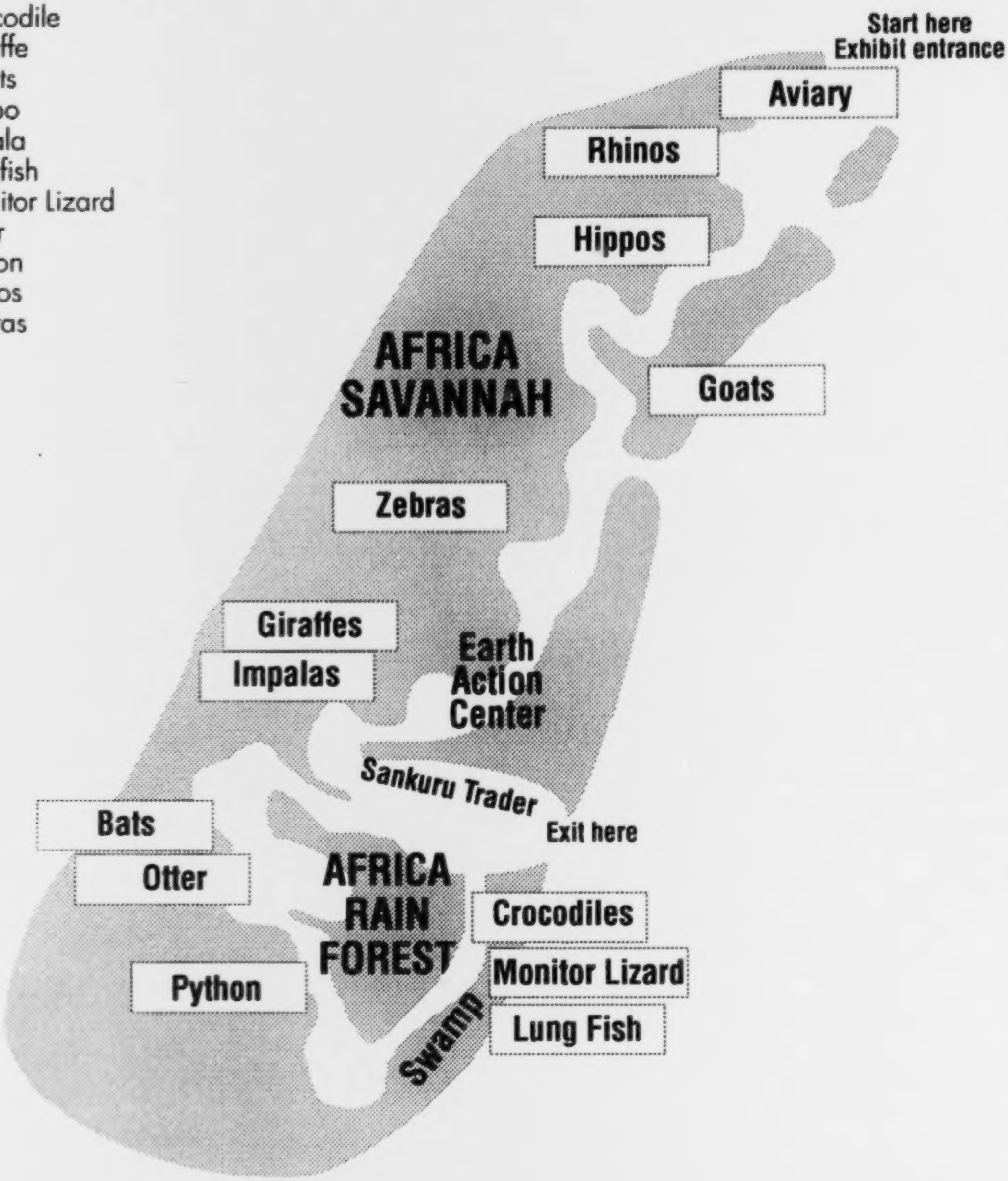

Start here
Exhibit entrance
AFRICA SAVANNAH
Earth Action Center
Sankuru Trader
Exit here
AFRICA RAIN FOREST
Swamp

# TOURING THE AFRICA EXHIBIT

## Answer Key

Locate and label the following animal exhibits in the Africa Exhibit while at the zoo.

- Aviary
- Bats
- Crocodile
- Giraffe
- Goats
- Hippo
- Impala
- Lungfish
- Monitor Lizard
- Otter
- Python
- Rhinos
- Zebras


Start here
Exhibit entrance
Aviary
Rhinos
Hippos
AFRICA SAVANNAH
Goats
Zebras
Giraffes
Impalas
Earth Action Center
Sankuru Trader
Exit here
Bats
Otter
AFRICA RAIN FOREST
Crocodiles
Monitor Lizard
Python
Lung Fish
Swamp

# ACTIVITIES
# FOR
# GRADES 3-5

☼ LAY OF THE LAND ☼

△ HOME SWEET HOME △

● A DIVERSE CAST OF PLAYERS ●

◈ GET A LIFE! ◈

◆ CARING NOW FOR THE FUTURE OF LIFE ◆

# THE LAY OF THE LAND

## GRADES 3-5

THE LAY OF THE LAND section has many activities to choose from including identifying countries in West, Central, and East Africa, and knowing which countries are located in the rainforest or savannah regions. In addition to using resource maps, students will use a database of information about countries in Africa to understand the lay of the land of Africa. The final activity asks students to identify the questions that they have about the countries in these two regions. Students will need to use research skills and develop oral or written reports of their findings.

The activities in this section are presented in several variations so the classroom teacher and students can select the ones that best meet their instructional goals and objectives. After determining the focus of the class instruction based on student interest and on prior knowledge of African countries, then select the activities that meet your classroom needs. Another option is to assign different activities to groups or individuals and have the information presented to the whole class. The activities in this section are described below:

### COUNTRIES OF AFRICA DATABASE
•A listing of African countries and information.

### COUNTRIES OF WEST AFRICA
•Locating the countries in West Africa.

### COUNTRIES OF CENTRAL AFRICA
•Locating the countries of Central Africa.

### COUNTRIES OF EAST AFRICA
•Locating the countries in East Africa.

### COUNTRIES OF THE SAVANNAH AND RAINFORESTS
•Locating countries that lie in the Savannah and Rainforest Regions. This activity can be further developed by identifying the countries that lie in West, Central, and East Africa.

### COUNTRIES OF THE SAVANNAH IN AFRICA*
•This activitiy only shows countries that lie in Savannah regions of Africa.

### AFRICAN COUNTRY QUESTION MAP*
•This research activity can be conducted as an introductory project or as an ending project.

*The starred activities can be adapted for use at higher levels.

# COUNTRIES OF AFRICA DATABASE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will learn about African countries, including the flag, capital city, total area, population-density, national language, local currency, date of independence, and status and name in colonial times.

SOCIAL STUDIES CCG'S: 1.2, 1.5, 2.1, 2.3, 3.5, 4.2, 4.4, 4.5, 6.1, 6.3, 6.5, 7.3, 8.1.

### VOCABULARY:

- area
- database
- population
- population density
- independence

### MATERIALS:

- Copies of the Countries of Africa Database.

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have students work individually or in groups to learn about the African countries.
- Have individuals or groups sort the countries by different characteristics such as: the largest in square mileage, greatest population, spoken languages, date of independence, etc.

### ENRICHMENT:

- Have students add other information to the database.
- Have students select one country to study more in depth (see African Country Question Map).
- Have students enter information into a computer database, sort information by different criteria, and create reports.

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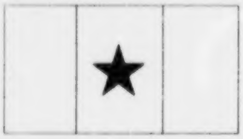
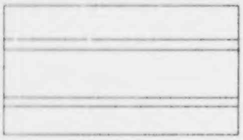
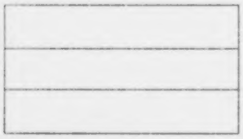
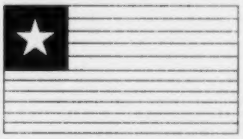
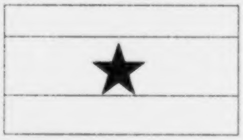
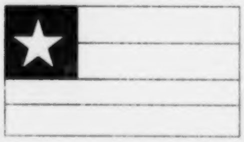
## LAY OF THE LAND · COUNTRIES OF AFRICA DATABASE · 3RD-5TH GRADE

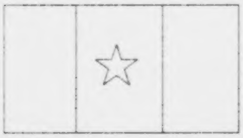
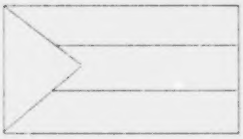
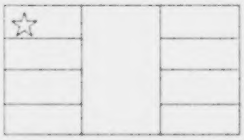
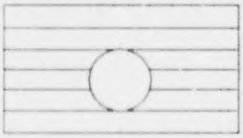
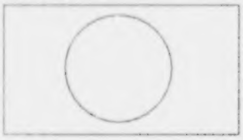
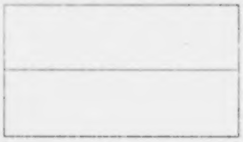
### WEST AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Senegal |  | Drakav | 75,750 sq. miles | 6,100,000<br>81 per sq. mile |
| Gambia |  | Banjul | 4,361 sq. miles | 600,000<br>138 per sq. mile |
| Guinea | | Conakry | 94,926 sq. miles | 5,400,000<br>57 per sq. miles |
| Sierra Leone |  | Freetown | 27,669 sq. miles | 3,800,000<br>137 per sq. mile |
| Liberia |  | Monrovia | 43,000 sq. miles | 2,100,000<br>49 per sq. mile |
| Ivory Coast | | Abidjan | 124,504 sq. miles | 8,900,000<br>71 per sq. mile |
| Ghana |  | Accra | 92,100 sq. miles | 13,900,000<br>151 per sq. mile |
| Togo |  | Lome | 21,622 sq. miles | 2,800,000<br>129 per sq. mile |

## WEST AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| French; Wolof, Fulani | 1 Franc CFA = 100 centimes | Aug.20, 1960 | 1659-1958: French Territory, 1958-1960: Mem. French Com. |
| Portuguese; Balante, Fulani, Mandyako, Malinke | 1 Guinea peso = 100 centavos | Sept. 10, 1974 | 1879-1951: Portuguese Colony, 1951-74 overseas Prov. of Portug. |
| French; Mandinke Fulani, Soso, Loma | 1 Styli = 100 cauris | Oct. 2, 1958 | French Colony (French Guinea) |
| English; Krio, Mende Temne | 1 Leone = 100 cents | April 27 1961 | 1787-1961: British Colony (Sierra Leone) |
| English | 1 Liberian dollar = 100 cents | Not Applicable | Independent |
| French; Malinke | 1 Franc CFA = 100 centimes | Aug. 7, 1960 | 1893-1960: French Colony (part of French West Africa) |
| English; Akan, Ewe | 1 New Cedi = 100 pesewas | March 6, 1957 | British Colony (The Gold Coast) |
| French; Ewe, Mina DaGomba,Tim, Cabrias | 1 Franc CFA = 100 centimes | April 27, 1960 | 1894-1918: German Colony (Togoland), 1919-1960: UN |

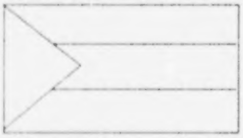
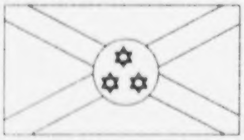
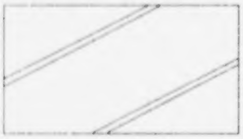
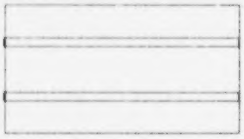
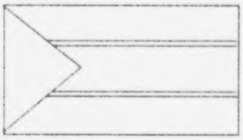
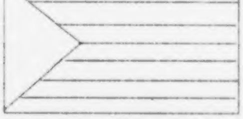
## CENTRAL AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Benin | | Porto Novo | 43,484 sq. miles | 3,800,000<br>87 per sq. mile |
| Nigeria | | Lagos | 356,669 sq. miles | 84,200,000<br>236 per sq. mile |
| Cameroon |  | Yaounde | 183,569 sq. miles | 9,100,000<br>50 per sq. mile |
| Equatorial Guinea |  | Malabo | 10,830 sq. miles | 300,000<br>28 per sq. mile |
| Central African Republic |  | Bangui | 240,535 sq. miles | 2,500,000<br>10 per sq. mile |
| Uganda |  | Kampala | 91,134 sq. miles | 13,800,000<br>151 per sq. mile |
| Zaire |  | Kinshasa | 905,568 sq. miles | 31,300,000<br>35 per sq. mile |
| Angola |  | Luanda | 481,354 sq. miles | 7,600,000<br>16 per sq. mile |

## CENTRAL AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| French; Fon, Mina, Yoruba, Dendi | 1 Franc CFA = 100 centimes | Aug. 1, 1960 | French Colony (Part of French West Africa) |
| English; Hausa, Fulani, Yoruba, Igbo | 1 Naira = 100 kobo | Oct. 1, 1960 | 1900-1960: British Colony (Nigeria) |
| French; English | 1 Franc CFA = 100 centimes | Jan. 1, 1960 (French Trusteeship)<br>Oct. 1, 1961 (British Trusteeship) | 1884-1914: German<br>1914-1916: British/German<br>1916-1946: French<br>1946-1961: UN. |
| Spanish | 1 ekuele = 100 centimes | Oct. 12, 1968 | Spanish Colony (Spanish Guinea) |
| French; Sango, Zande | 1 Franc CFA = 100 centimes | Aug. 13, 1960 | French Colony (Part of French West Africa) |
| English; Swahili | 1 Uganda shilling = 100 cents | Oct. 9, 1962 | 1893-1962: British protectorate (Uganda) |
| French; Lingala, Swahili, Tshiluba, | 1 Zaire = 100 Makuta | June 30, 1960 | 1884-1907: Congo Free State (Belgian), 1907-1960: Belgian |
| Portuguese; Umbundu, Kimbundu | 1 Kwanza = 100 Lwei | Nov. 11, 1975 | Portuguese Colony 1972-1975 overseas province: Angola |

## EAST AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Sudan |  | Khartoum | 967,500 sq. miles | 20,600,000<br>21 per sq. mile |
| Burundi |  | Bujumbura | 10,747 sq. miles | 4,500,000<br>419 per sq. mile |
| Tanzania |  | Dar es Salaam | 364,900 sq. miles | 20,500,000<br>56 per sq. mile |
| Kenya |  | Nairobi | 224,961 sq. miles | 18,600,000<br>83 per sq. mile |
| Zambia | | Lusaka | 290,586 sq. miles | 6,200,000<br>21 per sq. mile |
| Malawi | | Lilongwe | 45,747 sq. miles | 6,800,000<br>149 per sq. mile |
| Mozambique |  | Maputo | 302,330 sq. miles | 13,100,000<br>43 per sq. mile |
| Zimbabwe |  | Harare | 150,804 sq. miles | 8,400,000<br>56 per sq. mile |

## EAST AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| Arabic; English | 1 Sudanese lb = 100 piastres =1000 Milliemes | Jan.1, 1956 | 1898-1955: Anglo-Egyptian Condominium (Sudan) |
| Rundi; French, Swahili | 1 Burundi Franc = 100 centimes | July 1, 1962 | 1890-1919: German Colony (Part of German Africa) |
| Swahili | 1 Tanzanian CFA = 100 centimes | Dec. 9, 1961 Tanganyika<br>Oct. 1, 1961 (British Trusteeship) | 1884-1919: German Colony (Part of German East Africa)<br>1919-1961: British Trust Territory |
| Swahili; English | 1 Kenya Shilling = 100 cents | Dec. 12, 1963 | 1895-1920: British Colony<br>1920-1963: Crown Colony & Protectorate |
| English; Bemba, Tonga, Nyanja, Lozi | 1 Zambian Kwacha = 100 ngwee | Oct. 24, 1964 | British Colony with the names N.W. Rhodesia & N.E. Rhodesia (1895 -1911)<br>1911-1963 - Northern Rhodesia |
| English; Chichewa | 1 Malawi kwacha = 100 tambala | July 6, 1964 | 1891-1907: British Protectorate<br>1907-1953: Nyasa Land Protectorate<br>1953-1963: Member of CAF |
| Portuguese | 1 Mozambique escudo = 100 centavos | June 25, 1975 | 1505 -1952: Portuguese Colony<br>1952-1972: overseas Province |
| English; Shona, Ndebele | 1 dollar = 100 cents | April 18, 1980 | 1890-1923: British Colony<br>1923-1953: Self-governing<br>1953-1965: Member of CAF<br>1965-1979: Illegal independence<br>1979-1980: British Colony |

# COUNTRIES OF WEST AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries that lie in West Africa.

SOCIAL STUDIES CCG'S: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

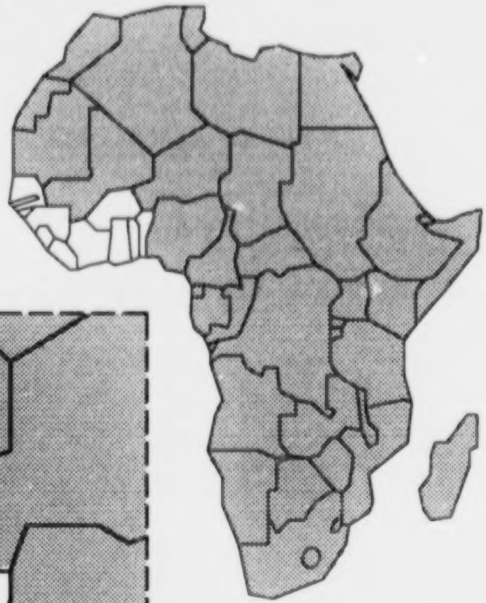
- Maps of Africa showing countries.
- Copies of the outline map showing boundaries of African Countries.
- Copies of the student activity for Countries of West Africa.
- Pencils
- Crayons

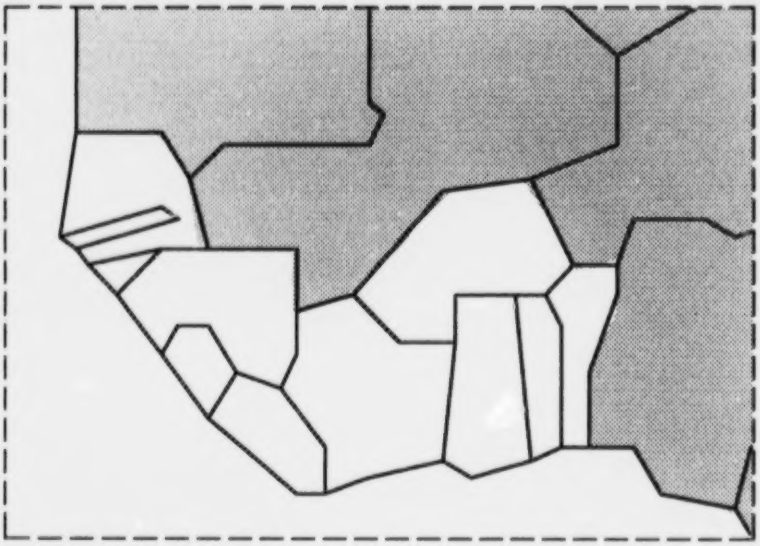
### ACTIVITY DIRECTIONS:

- Have students work individually or in groups to complete the word scramble activity and then label the map of Africa.
- Have students share their answers and make corrections.

# COUNTRIES OF WEST AFRICA

Unscramble the names of countries of West Africa in the puzzle below, then label them with the letters from the map key on the outline map of Africa.





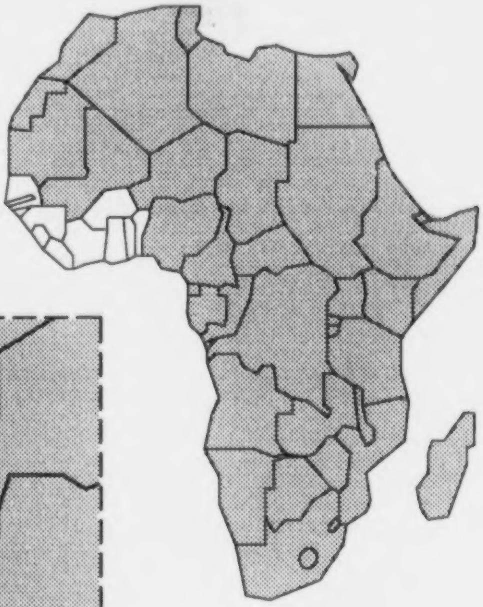
**Map Key**

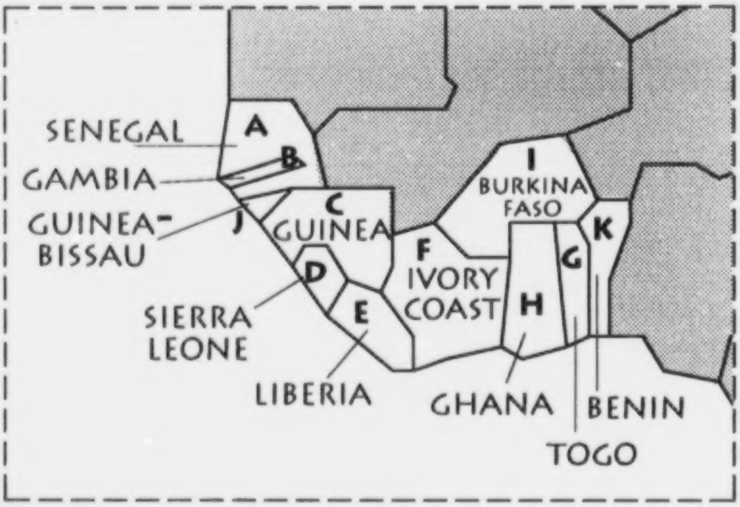
| | |
|---|---|
| EGLNESA | A. ________ |
| BAGIAM | B. _______ |
| NIGEUA | C. _______ |
| RASERI ONELE | D. _______ ______ |
| IBLREAI | E. ________ |
| RVOYI STOAC | F. ______ ______ |
| GOTO | G. _____ |
| HANAG | H. ______ |
| KRUNABI SOFA | I. _________ _____ |
| INGEAU-SIBUAS | J. ______________ |
| NEBIN | K. ______ |

# COUNTRIES OF WEST AFRICA

## Answer Key

Unscramble the names of countries of West Africa in the puzzle below, then label them with the letters from the map key on the outline map of Africa.




A
SENEGAL
B
GAMBIA
C
GUINEA
GUINEA-BISSAU
J
D
SIERRA LEONE
E
LIBERIA
F
IVORY COAST
I
BURKINA FASO
K
G
H
GHANA
BENIN
TOGO

**Map Key**

| | |
|---|---|
| EGLNESA | A. SENEGAL |
| BAGIAM | B. GAMBIA |
| NIGEUA | C. GUINEA |
| RASERI ONELE | D. SIERRA LEONE |
| IBLREAI | E. LIBERIA |
| RVOYI STOAC | F. IVORY COAST |
| GOTO | G. TOGO |
| HANAG | H. GHANA |
| KRUNABI SOFA | I. BURKINA FASO |
| INGEAU-SIBUAS | J. GUINEA-BISSAU |
| NEBIN | K. BENIN |

# COUNTRIES OF CENTRAL AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries that lie in Central Africa.

SOCIAL STUDIES CCG'S: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

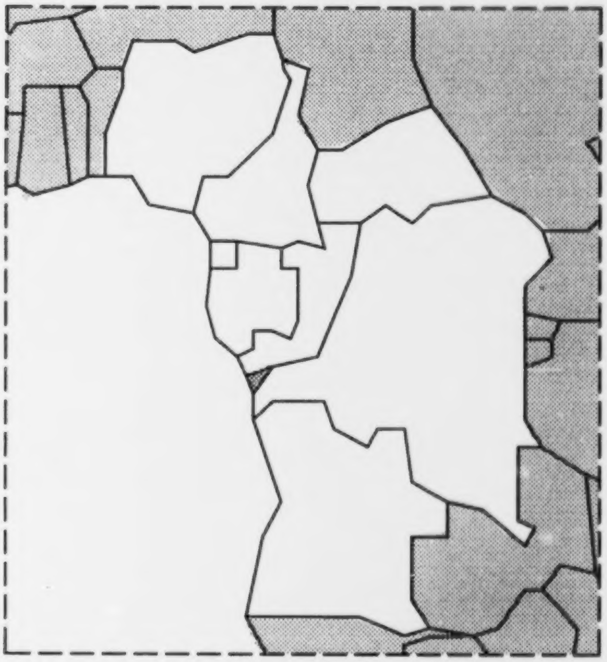
- •Maps of Africa showing countries.
- •Copies of the outline map of African Countries.
- •Copies of the student activity for countries of Central Africa.
- •Pencils
- •Crayons
- •(optional) Copies of the Countries of Africa Database.

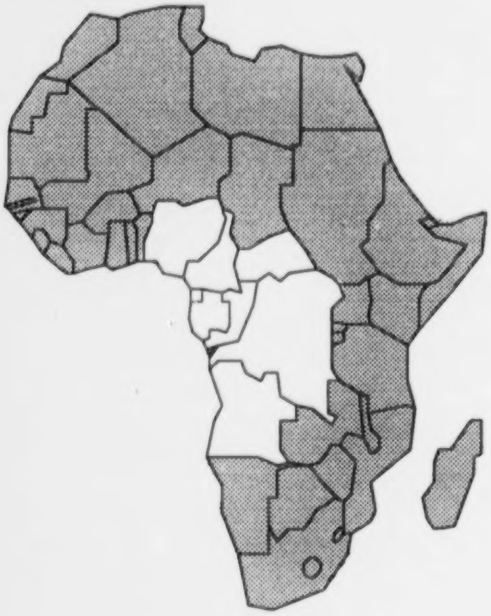
### ACTIVITY DIRECTIONS:

- •Have students work individually or in groups to complete the capital city puzzle activity and then label the countries of Central Africa on the outline map of Africa.
- •Have students share their answers and make corrections.

# COUNTRIES OF CENTRAL AFRICA

Match the capital cities with the names of countries of Central Africa in the puzzle below, then label them with the letters from the map key on the outline map of Africa.





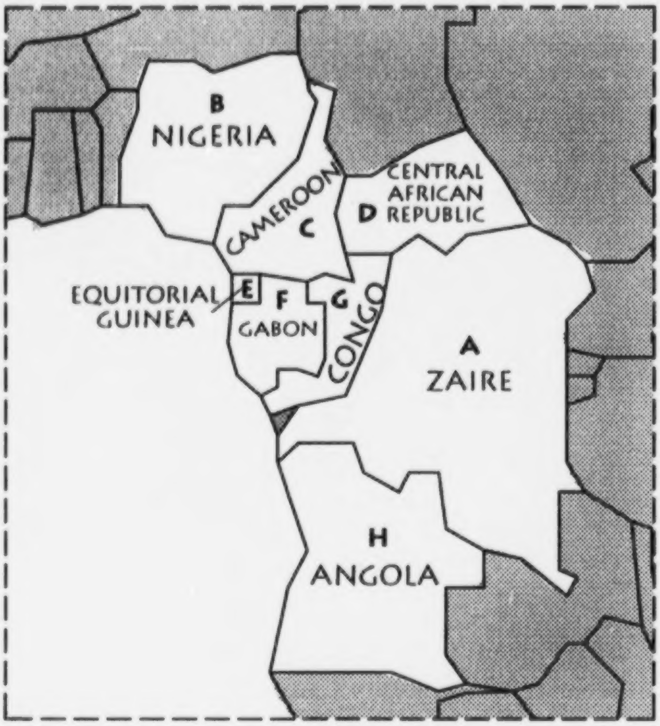
**Map Key**

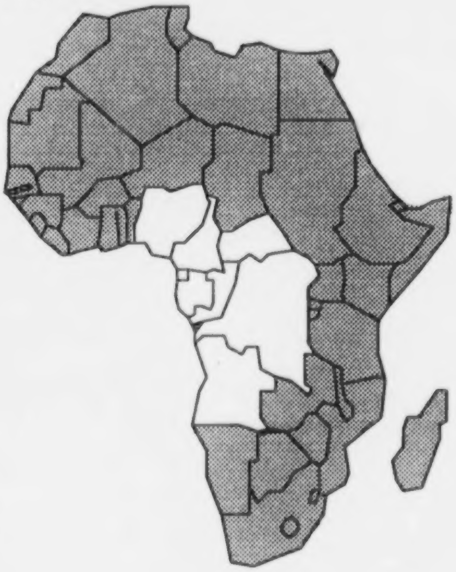
KINSHASA A. ____________________
LAGOS B. ____________________
YAOUNDE C. ____________________
BANGUI D. ____________________
MALABO E. ____________________
LIBREVILLE F. ____________________
BRAZZAVILLE G. ____________________
LUANDA H. ____________________

# COUNTRIES OF CENTRAL AFRICA

## Answer Key

Match the capital cities with the names of countries of Central Africa in the puzzle below, then label them with the letters from the map key on the outline map of Africa.


B
NIGERIA
CAMEROON
C
CENTRAL AFRICAN REPUBLIC
D
EQUITORIAL GUINEA
E
F
GABON
G
CONGO
A
ZAIRE
H
ANGOLA



### Map Key

| | |
|---|---|
| KINSHASA | A. ZAIRE |
| LAGOS | B. NIGERIA |
| YAOUNDE | C. CAMEROON |
| BANGUI | D. CENTRAL AFRICAN REPUBLIC |
| MALABO | E. EQUATORIAL GUINEA |
| LIBREVILLE | F. GABON |
| BRAZZAVILLE | G. CONGO |
| LUANDA | H. ANGOLA |

# COUNTRIES OF EAST AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries that lie in East Africa.

SOCIAL STUDIES CCG'S: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

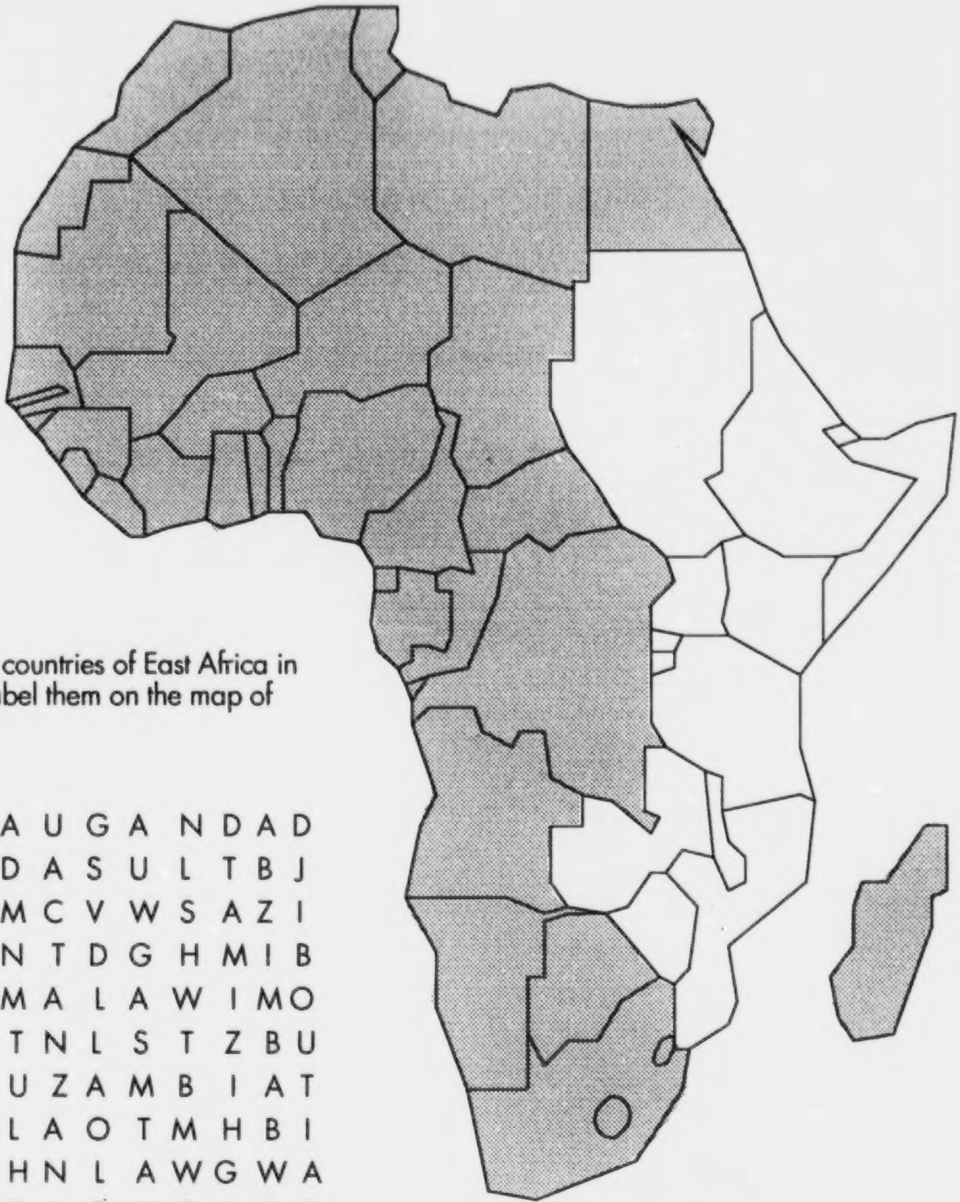
- Maps of Africa showing countries.
- Copies of the outline map showing boundaries of African Countries.
- Copies of the student activity for Countries of East Africa.
- Pencils
- Crayons

### ACTIVITY DIRECTIONS:

- Have students work individually or in groups to complete the word search activity and then label the map of Africa.
- Have students share their answers and make corrections.

# COUNTRIES OF EAST AFRICA

SUDAN
BURUNDI
TANZANIA
KENYA
ZAMBIA
MALAWI
MOZAMBIQUE
ZIMBABWE
RWANDA
UGANDA
DJIBOUTI
ETHIOPIA
SOMALIA



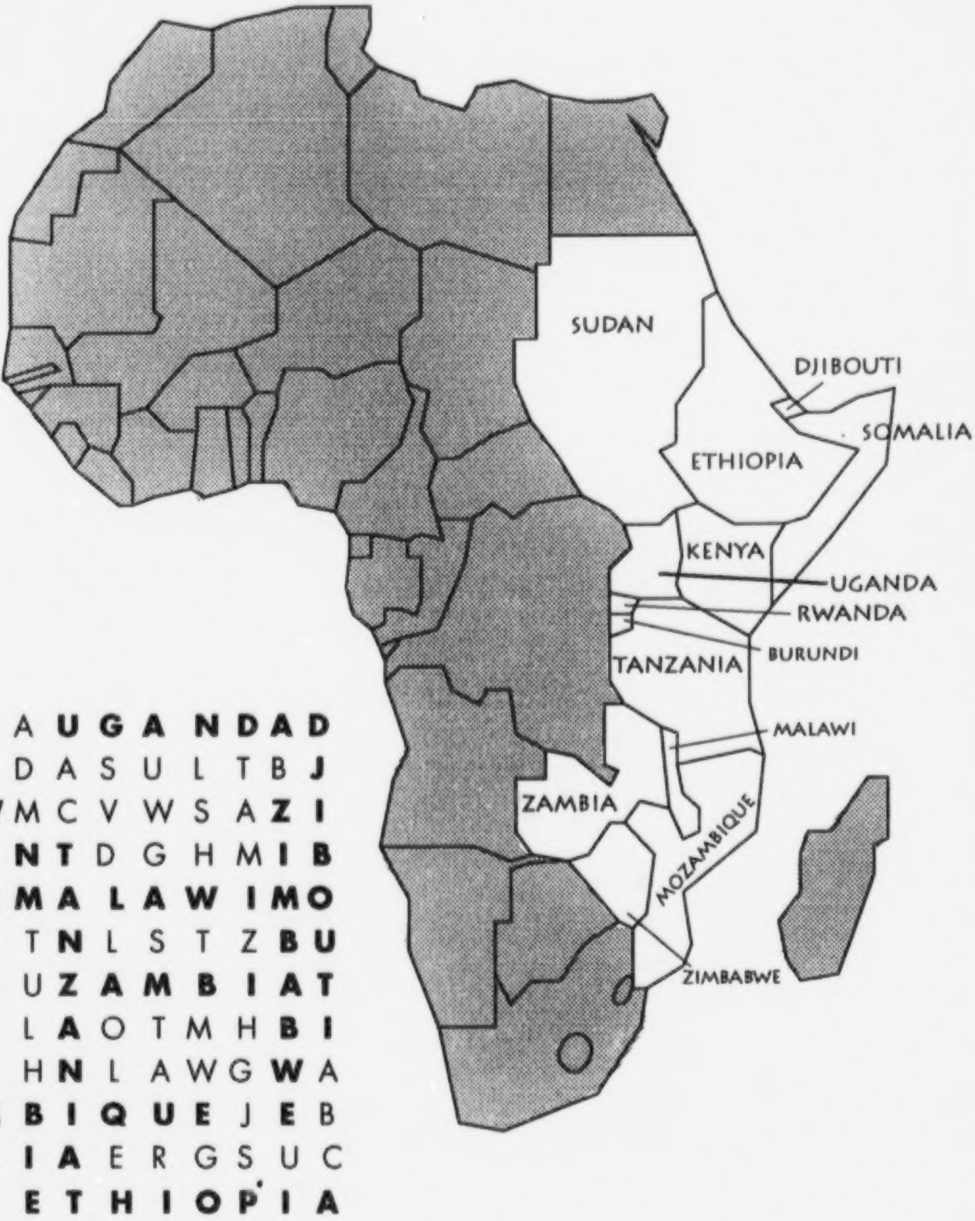
Find the names of countries of East Africa in the puzzle, then label them on the map of Africa.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | A | B | T | R | A | U | G | A | N | D | A | D |
| R | E | U | G | R | D | A | S | U | L | T | B | J |
| A | Y | R | F | W | M | C | V | W | S | A | Z | I |
| G | S | U | D | A | N | T | D | G | H | M | I | B |
| H | I | N | T | N | M | A | L | A | W | I | M | O |
| A | W | D | A | D | T | N | L | S | T | Z | B | U |
| N | R | I | D | A | U | Z | A | M | B | I | A | T |
| K | E | N | Y | A | L | A | O | T | M | H | B | I |
| I | T | S | A | G | H | N | L | A | W | G | W | A |
| M | O | Z | A | M | B | I | Q | U | E | J | E | B |
| S | O | M | A | L | I | A | E | R | G | S | U | C |
| D | A | H | L | R | E | T | H | I | O | P | I | A |

# COUNTRIES OF EAST AFRICA

## Answer Key

Find the names of countries of East Africa in the puzzle below, then label them on the map of Africa.


SUDAN
DJIBOUTI
SOMALIA
ETHIOPIA
KENYA
UGANDA
RWANDA
BURUNDI
TANZANIA
MALAWI
ZAMBIA
MOZAMBIQUE
ZIMBABWE

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | A | **B** | T | R | A | **U** | **G** | **A** | **N** | **D** | **A** | **D** |
| R | E | **U** | G | **R** | D | A | S | U | L | T | B | **J** |
| A | Y | **R** | F | **W** | M | C | V | W | S | A | **Z** | **I** |
| G | **S** | **U** | **D** | **A** | **N** | **T** | D | G | H | M | **I** | **B** |
| H | I | **N** | T | **N** | **M** | **A** | **L** | **A** | **W** | **I** | **M** | **O** |
| A | W | **D** | A | **D** | T | **N** | L | S | T | Z | **B** | **U** |
| N | R | **I** | D | **A** | U | **Z** | **A** | **M** | **B** | **I** | **A** | **T** |
| **K** | **E** | **N** | **Y** | **A** | L | **A** | O | T | M | H | **B** | **I** |
| I | T | S | A | G | H | **N** | L | A | W | G | **W** | A |
| **M** | **O** | **Z** | **A** | **M** | **B** | **I** | **Q** | **U** | **E** | J | **E** | B |
| **S** | **O** | **M** | **A** | **L** | **I** | **A** | E | R | G | S | U | C |
| D | A | H | L | R | **E** | **T** | **H** | **I** | **O** | **P** | **I** | **A** |

# COUNTRIES OF THE SAVANNAH AND RAINFOREST

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries of the savannah and rainforest and label them on a map of Africa based on the information about countries in West Africa, Central Africa, and East Africa located in the Countries of Africa Database.

Social Studies CCG's: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### VOCABULARY:

- review vocabulary from previous activities

### MATERIALS:

- Maps of Africa.
- Copies of the student directions for Countries of the Savannah and Rainforest.
- Copies of the Countries of Africa Database.

### ACTIVITY DIRECTIONS:

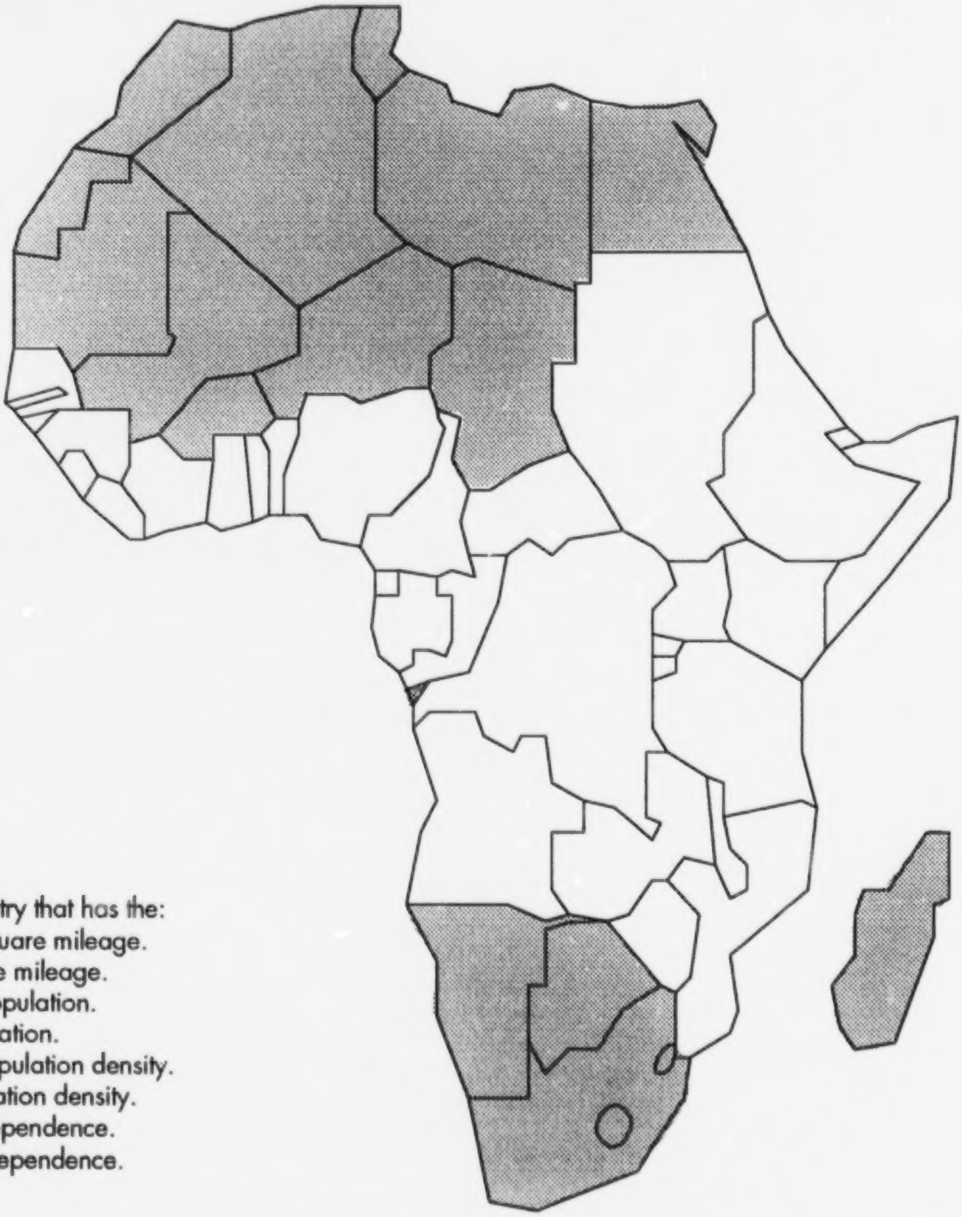
- Review activity vocabulary.
- Have students work individually or in groups to complete the activity sheets using a map of Africa and the Countries of Africa Database.
- Have individuals or groups share their answers and make corrections.

### ENRICHMENT:

- Have students create their own questions for each other to answer based on the information in the Countries of Africa Database.

# COUNTRIES OF THE SAVANNAH AND RAINFOREST

Using a map of Africa, locate and label the answer to the phrases in the map key based on the information about countries in West Africa, Central Africa, and East Africa from the Countries of Africa Database.



**Map Key:**

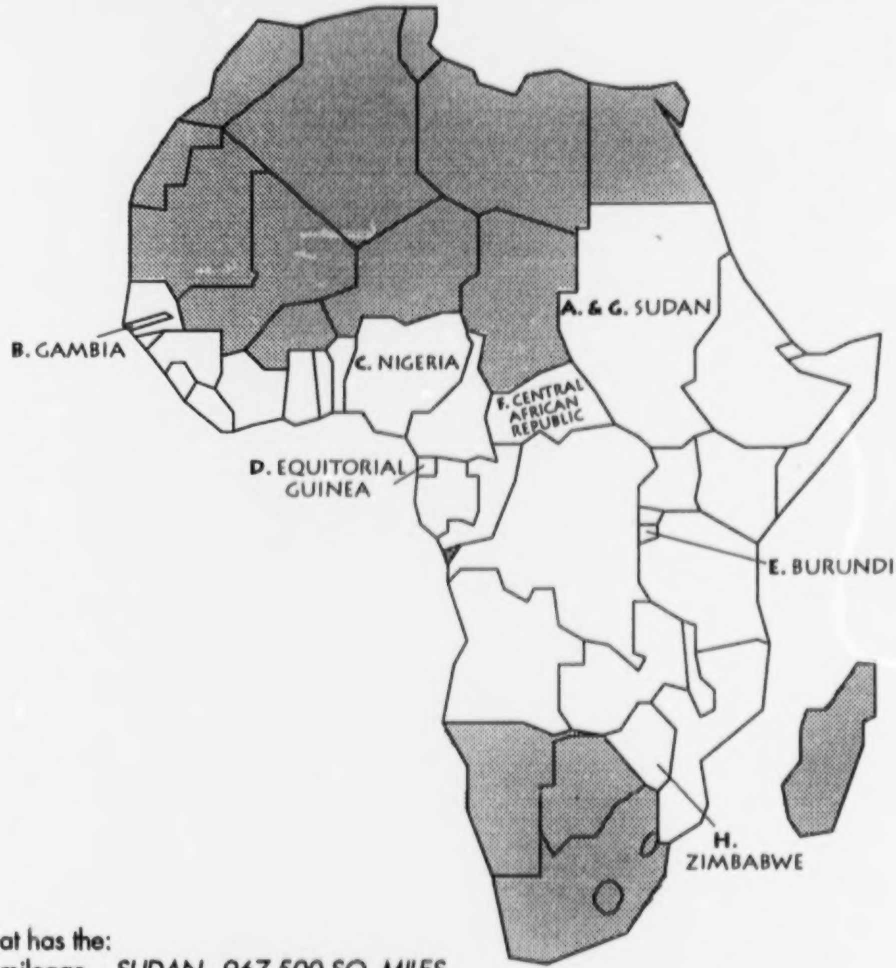
Mark the country that has the:

A - greatest square mileage.
B - least square mileage.
C - greatest population.
D - least population.
E - greatest population density.
F - least population density.
G - oldest independence.
H - newest independence.

# COUNTRIES OF THE SAVANNAH AND RAINFORESTS

## Answer Key

Using a map of Africa, locate and label the answer to the phrases in the map key based on the information about countries in West Africa, Central Africa, and East Africa from the Countries of Africa Database.


A. & G. SUDAN
B. GAMBIA
C. NIGERIA
F. CENTRAL AFRICAN REPUBLIC
D. EQUITORIAL GUINEA
E. BURUNDI
H. ZIMBABWE

**Map Key:**

Mark the country that has the:

A - greatest square mileage. - *SUDAN - 967,500 SQ. MILES*
B - least square mileage. - *GAMBIA - 4,361 SQ. MILES*
C - greatest population. - *NIGERIA - 84,200,000 PEOPLE*
D - least population. - *EQUATORIAL GUINEA - 300,000 PEOPLE*
E - greatest population density. - *BURUNDI - 419 PEOPLE PER SQ. FOOT*
F - least population density. - *CENTRAL AFRICAN REPUBLIC - 10 PEOPLE PER SQ. MILE*
G - oldest independence. - *SUDAN - JANUARY 1, 1956*
H - newest independence. - *ZIMBABWE - APRIL 18, 1980*

# COUNTRIES OF THE SAVANNAH IN AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries that lie within the savannah region of Africa.

SOCIAL STUDIES CCG'S: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

- Maps of Africa showing countries.
- Climate and vegetation maps of Africa from an atlas or textbooks.
- Copies of the outline map of African countries.
- Copies of the student information for Countries of the Savannah
- Pencils
- Crayons

### ENRICHMENT:

- Students study a specific savannah country and prepare a short report.
- Have students create another map identifying countries with rainforest regions.

### ACTIVITY DIRECTIONS:

- Have students work individually or in groups to complete the activity sheets using maps of Africa showing countries, climate and vegetation.
- Have students share their answers and make corrections.

# COUNTRIES OF THE SAVANNAH IN AFRICA

The African savannahs lie both north and south of the African rainforests. Savannahs are broad grasslands with scattered, flat-topped trees. The savannahs cover nearly half of the continent of Africa. Most of the savannah gets little rain, but in the areas of the savannah that receive rainfall, clumps of trees stand close together.

The most common vegetation is the tall coarse grass. The outer edges of the savannah is the "veld". This has short grasses mixed with shrubs. South of the great Sahara Desert is a large area of savannah and veld called the Sudan Grasslands. This grassland stretches almost from coast to coast. Most of Africa's savannahs lie in the Sudan Grasslands and parts of Central and Eastern Africa.

Locate, label, and color the countries of the Savannah Region with the following code:

1. Color the countries that begin with the letter B - blue.
2. Color the countries that begin with the letter C - green.
3. Color the countries that begin with the letter G - yellow.
4. Color the countries that begin with the letter K - brown.
5. Color the countries that begin with the letter M - red.
6. Color the countries that begin with the letter N - orange.
7. Color the countries that begin with the letter S - purple.
8. Color the countries that begin with the letter T - pink.
9. Color the countries that begin with the letter U - grey.
10. Color the countries that begin with the letter Z - black.

**Countries of the African Savannah**

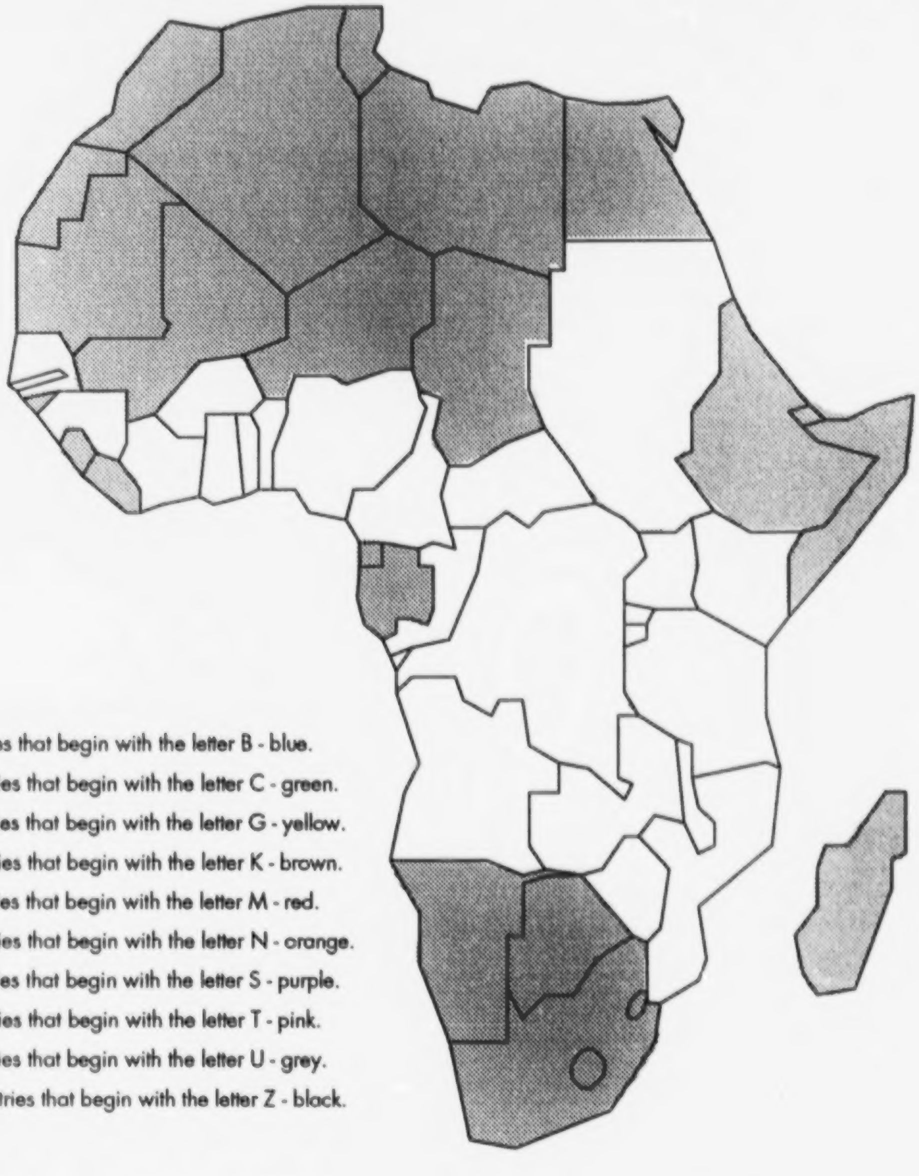
Senegal
Gambia
Guinea
Ivory Coast
Burkina Faso
Ghana
Togo
Mozambique
Benin
Nigeria
Rwanda
Congo

Cameroon
Malawi
Burundi
Angola
Central African Republic
Sudan
Uganda
Kenya
Tanzania
Zimbabwe
Zaire
Zambia

Some of these countries have savannah everywhere. Others have rainforest or some habitat covering part of their land

# COUNTRIES OF THE SAVANNAH IN AFRICA

Locate, label, and color the countries of the Savannah Region with the following code:

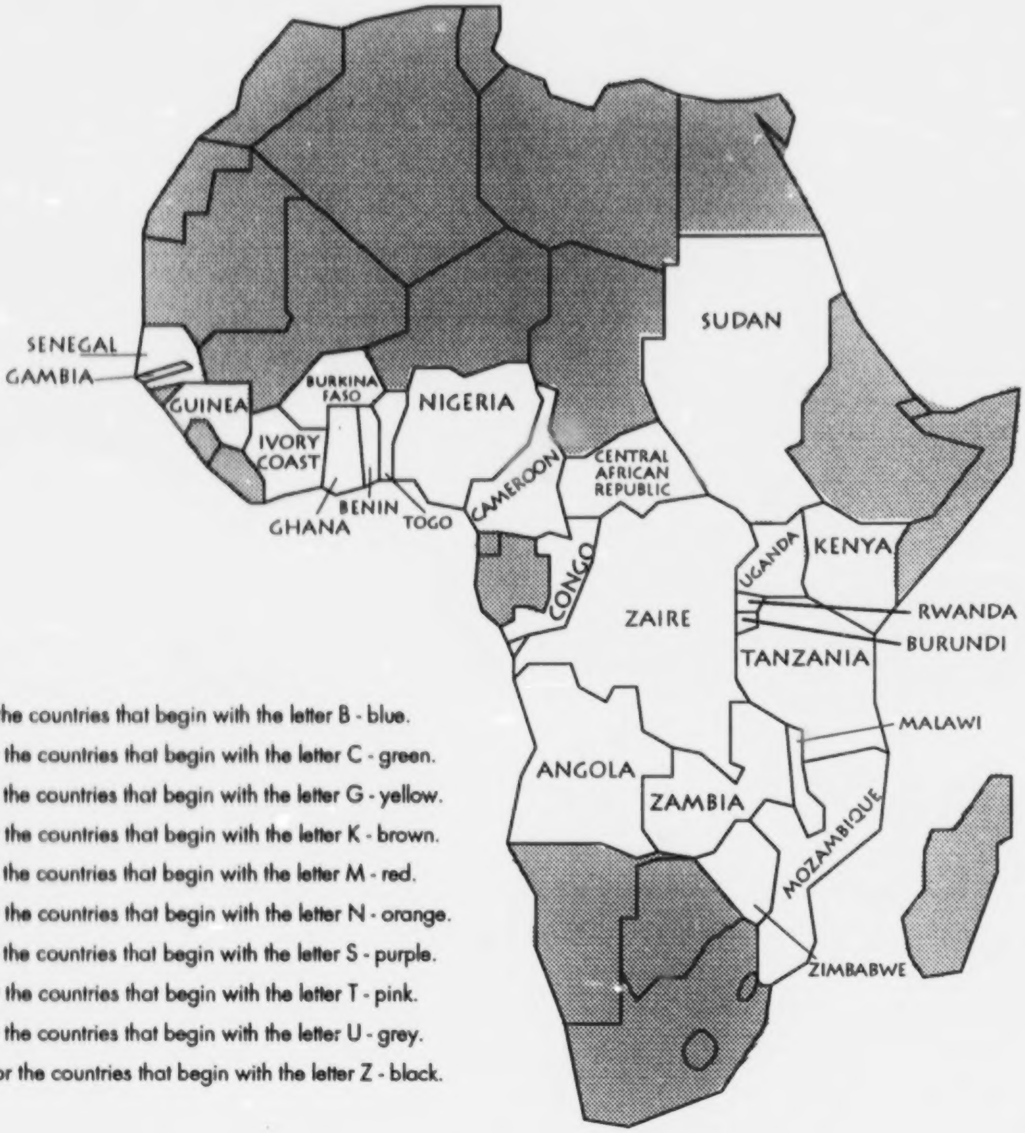


1. Color the countries that begin with the letter B - blue.
2. Color the countries that begin with the letter C - green.
3. Color the countries that begin with the letter G - yellow.
4. Color the countries that begin with the letter K - brown.
5. Color the countries that begin with the letter M - red.
6. Color the countries that begin with the letter N - orange.
7. Color the countries that begin with the letter S - purple.
8. Color the countries that begin with the letter T - pink.
9. Color the countries that begin with the letter U - grey.
10. Color the countries that begin with the letter Z - black.

# COUNTRIES OF THE SAVANNAH IN AFRICA

## Answer Key

Locate, label, and color the countries of the Savannah Region with the following code:


SUDAN
SENEGAL
GAMBIA
GUINEA
BURKINA FASO
NIGERIA
IVORY COAST
CENTRAL AFRICAN REPUBLIC
CAMEROON
BENIN
GHANA
TOGO
UGANDA
KENYA
CONGO
ZAIRE
RWANDA
BURUNDI
TANZANIA
MALAWI
ANGOLA
ZAMBIA
MOZAMBIQUE
ZIMBABWE

1. Color the countries that begin with the letter B - blue.
2. Color the countries that begin with the letter C - green.
3. Color the countries that begin with the letter G - yellow.
4. Color the countries that begin with the letter K - brown.
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6. Color the countries that begin with the letter N - orange.
7. Color the countries that begin with the letter S - purple.
8. Color the countries that begin with the letter T - pink.
9. Color the countries that begin with the letter U - grey.
10. Color the countries that begin with the letter Z - black.

# AFRICAN COUNTRY QUESTION MAP

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to choose an African country to study and develop questions to research to write a brief report.

Social Studies CCG's: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1.

### MATERIALS:

- Copies of the African Country Question Map.

### ACTIVITY DIRECTIONS:

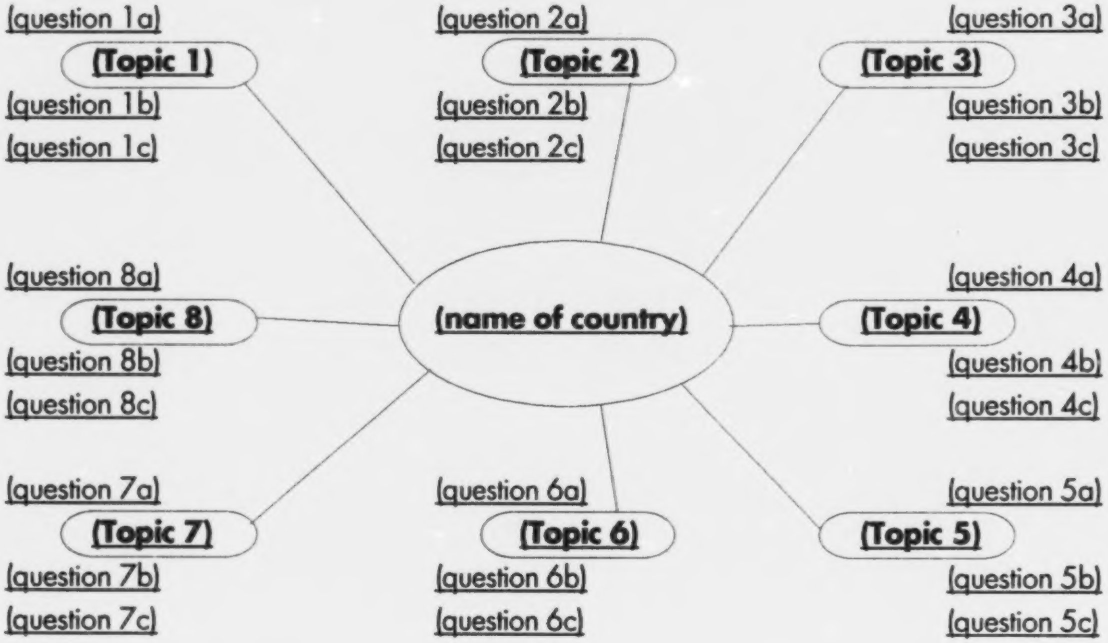
- Have students as individuals or in groups, choose a country to research.
- Instruct them to think of questions they would like to find the answers for, and fill in the Question Map.
- Give them time to research their questions and write brief reports (draft, revise, edit, and produce final copy).
- Have students share their reports orally or in written form.

### ENRICHMENT:

- Develop other questions that students would like to research.
- Have students share their information in a speech, drama, art display, video, or some other appropriate manner.

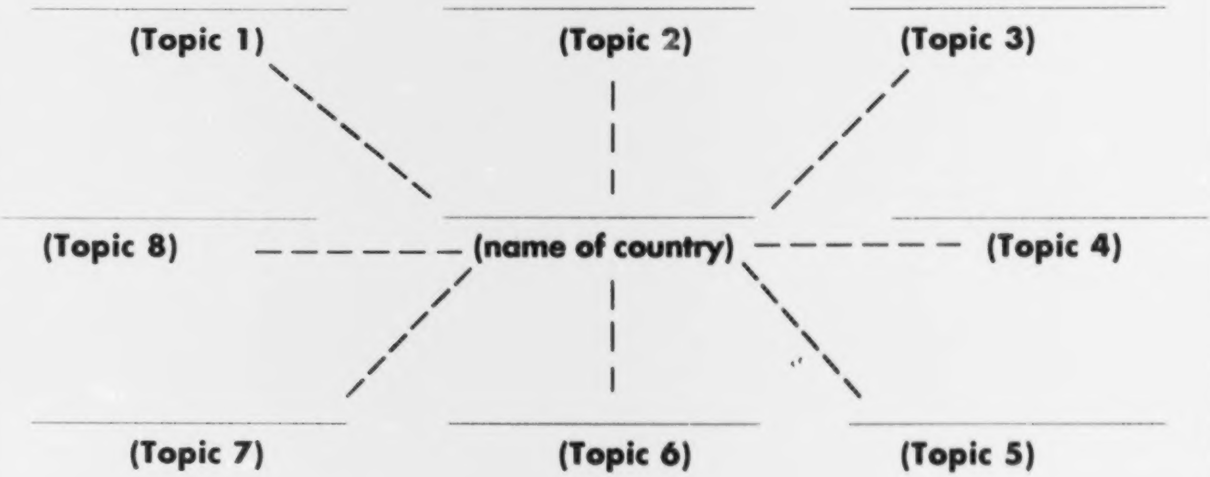
# AFRICAN COUNTRY QUESTION MAP

1. Choose a country in Africa that you want to know more about.
2. Think of things that you want to know more about your country.
3. Write the questions using the format of the question map below.
4. Write a brief report on your country, answering the questions.


(question 1a)
(Topic 1)
(question 1b)
(question 1c)
(question 2a)
(Topic 2)
(question 2b)
(question 2c)
(question 3a)
(Topic 3)
(question 3b)
(question 3c)
(question 8a)
(Topic 8)
(question 8b)
(question 8c)
(name of country)
(question 4a)
(Topic 4)
(question 4b)
(question 4c)
(question 7a)
(Topic 7)
(question 7b)
(question 7c)
(question 6a)
(Topic 6)
(question 6b)
(question 6c)
(question 5a)
(Topic 5)
(question 5b)
(question 5c)

# AFRICAN COUNTRY QUESTION MAP

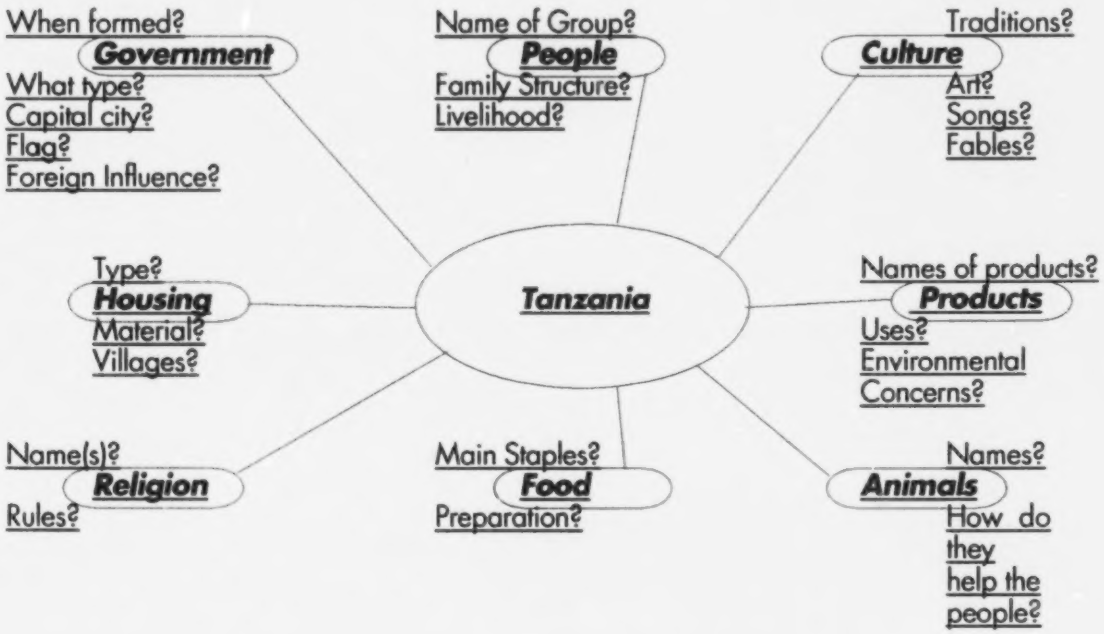
1. Choose a country in Africa that you want to know more about.
2. Think of things that you want to know more about your country.
3. Write the questions using the format of the question map below.
4. Write a brief report on your country, answering the questions.


(Topic 1)
(Topic 2)
(Topic 3)
(Topic 8)
(name of country)
(Topic 4)
(Topic 7)
(Topic 6)
(Topic 5)

# AFRICAN COUNTRY QUESTION MAP

1. Choose a country in Africa that you want to know more about.
2. Think of things that you want to know more about your country.
3. Write the questions using the format of the question map below.
4. Write a brief report on your country, answering the questions.

**SAMPLE:**


When formed?
Government
What type?
Capital city?
Flag?
Foreign Influence?
Name of Group?
People
Family Structure?
Livelihood?
Traditions?
Culture
Art?
Songs?
Fables?
Type?
Housing
Material?
Villages?
Tanzania
Names of products?
Products
Uses?
Environmental Concerns?
Name(s)?
Religion
Rules?
Main Staples?
Food
Preparation?
Names?
Animals
How do they help the people?

Related activity in 6th-8th grade section-"African Country Portfolio".

# HOME SWEET HOME

△

## GRADES 3-5

HOME, SWEET HOME section focuses on the characteristics of the rainforest and the savannah habitats. These activities are designed to increase the students' awareness of the climate of the regions. At the zoo, students are asked to decribe the habitats of one of the regions by decribing a day in the life of an African animal.

After determining the focus of study, select from the activities in this section. Students may complete the activities individually or in groups and present the information to the whole group. The activities in this section are described below:

### TROPICAL RAINFORESTS: EARTH'S LIVING TREASURES

- Provides information about the Tropical Rainforests.

### ON THE SAVANNAH

- Students locate African Savannah on a map of Africa, study the savannah's climatic conditions, and learn about the basic ecology of the savannah.

### WET AND DRY*

- Students identify different climates in Africa and color a climate map.

### AFRICA'S RAINFOREST

- Students locate rainforest regions on a map of Africa.

### CLIMATE COMPARISON*

- Students compare the average rainfall and temperature in Africa with their own area.

### RAINFALL HABITATS PUZZLE

- Students locate four cities on an outline map of Africa based on information given in a rainfall chart.

### A DAY IN MY LIFE

- Students gather descriptive information about the rainforest or savannah regions. They imagine themselves living in one of these regions and write a descriptive piece about a day in their life.

# TROPICAL RAINFORESTS EARTH'S LIVING TREASURES

## Teacher Information

### OBJECTIVES:

Students will demonstrate the ability to:

- understand that tropical rainforests support diverse plant and animal life
- understand that humans obtain many resources from tropical rainforests
- understand that scientists still know very little about life in tropical rainforests
- understand climatic conditions necessary for tropical rainforests to exist
- understand that tropical rainforests grow in distinct layers

SCIENCE CCG's
CONCEPTS: 1.1 - 1.8, 1.10 - 1.12, 1.14
PROCESSES: 2.6, 2.12, 2.15

### VOCABULARY:

adaptations, buttress roots, cacao, canopy, elevation, emergent, epiphytes, equator, forest floor, humid, tropical rainforest, Tropic of Cancer, Tropic of Capricorn, understory.

### MATERIALS:

"Tropical Rainforests—Earth's Living Treasures" student texts; "Rainforest Vocabulary Review" activity sheets.

### ACTIVITY DIRECTIONS:

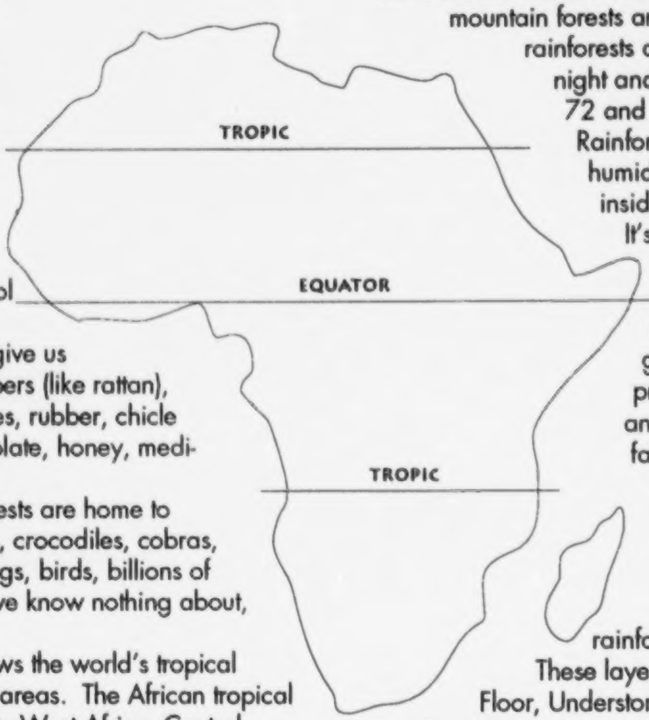
1. Introduce and/or review vocabulary words at left with your students.
2. Read "Tropical Rainforests—Earth's Living Treasures" together aloud as a class, stopping to discuss and clarify along the way.
3. Assign your students "Rainforest Vocabulary Review" activity sheets.

# TROPICAL RAINFORESTS EARTH'S LIVING TREASURES

Why are tropical rainforests "living treasures?" Here are a few reasons. They only cover 7% of the earth, but...

- 4 out of every 5 plants live there
- perhaps 30 million species of plants and animals live there.
- an area of tropical rainforest the size of your school could have over 42,000 species of insects and 750 species of trees on it. How many does your school have?
- tropical rainforests give us woods, oils, resins, fibers (like rattan), nuts, fruits, spices, dyes, rubber, chicle (chewing gum), chocolate, honey, medicine and much more.
- and tropical rainforests are home to gorillas, chimpanzees, crocodiles, cobras, pythons, monkeys, frogs, birds, billions of insects, many things we know nothing about, and a lot of people.

The map here shows the world's tropical rainforests as shaded areas. The African tropical rainforests are found in West Africa, Central Africa, on the large island of Madagascar, and on the Comoros Islands. Can you find them?

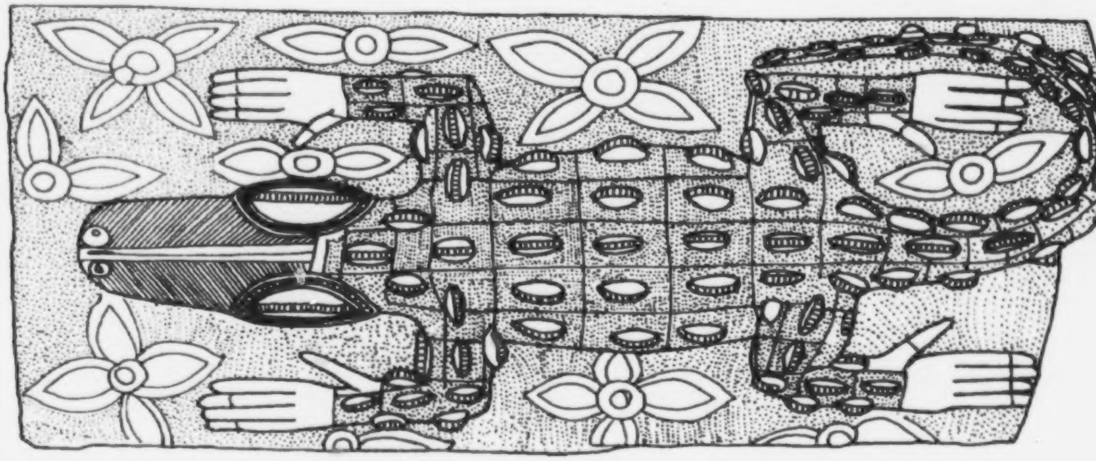


There are other kinds of rainforests, but tropical rainforests are "tropical"...That means they are located between the Tropic of Cancer and the Tropic of Capricorn, and near the equator. Find these lines on the map.

Tropical rainforests are wet all year. They must receive at least 80 inches of rain each year. Some receive over 400 inches per year! (Portland, Oregon receives nearly 40 inches per year.) These forests must also be in low elevations, as mountain forests are different. Tropical rainforests are hot all day, all night and all year, between 72 and 85 degrees F. Rainforest air is also very humid (moist), like the inside of a greenhouse. It's like a hot, wet summer all of the time in tropical rainforests, so plants grow extremely well, providing food for animals. Rain usually falls in late afternoon thunderstorms, and it falls very hard. But nearly every day is mostly sunny.

The life of tropical rainforests grows in layers. These layers are called Forest Floor, Understory, Canopy and Emergent.

Emergents are giant trees that stick out above the canopy. They reach heights of 150 to 250 feet, with huge trunks that don't branch out until they're above the canopy. Since the soil is very shallow, trees spread their roots wide to hold themselves up. Emergents often have huge buttress roots up to ten feet tall, that stick out from the trunk many feet in all directions. Emergents and animals that live in them must endure high winds, hot sun



and hard rains. Eagles nest in emergents. Other birds, and many small, climbing animals also live in them.

The canopy looks like a sea of broccoli tops. It is made of the crowns of trees growing 65 to 100 feet high. Here the plants grow so thick they block 95% of sunlight from reaching the forest floor, making it very dark below. Vines weave in and out of trees, using them for support. Many hanging plants called epiphytes grow on the branches of trees. Epiphytes get their nutrients from the air! Some are shaped to catch and hold rainwater, creating small ponds in the trees, where small animals may live.

Most rainforest life is in the canopy. Plants compete with each other for light, which they need to make food for themselves. Animals are there to eat the plants, or to eat other animals. They aren't large, like savannah animals, because size doesn't help animals survive in treetops. But they do have adaptations for climbing, leaping, flying, or just hanging around. Monkeys have long, strong arms, legs, and fingers. Their toes grasp branches like hands. Sloths climb with hooked claws. Frogs hang on with suction cup feet. Birds fly, while flying squirrels glide downward using flaps of skin that stretch out between their arms and legs. Some monkeys leap great distances (20 to 50 feet) through the air, branch to branch. Leaf-cutter ants sometimes ride their falling leaves to the forest floor, unharmed.

The understory is thin and made up of small trees, shrubs and tree ferns ten to fifteen feet tall. Some are "waiting" for a hole in the canopy to grow into. This happens when an older tree dies and falls. But it's a race to fill the space, and most young trees never make it. Other understory plants live their full life cycles in the understory. Cacao is an understory plant. Cacao produces cocoa beans, which we use to make chocolate.

The forest floor is very open, and is easy to walk through. Tropical rainforest floor is only thick with plants on its edges, near rivers and meadows where forest ends. At the edges, sunlight reaches the ground, so plants grow just as thick as the canopy to compete for the light. Inside the forest it is dark with mostly bare soil and roots of trees everywhere. Soil is shallow and you see almost no dead plant or animal parts. These are immediately eaten and re-eaten by large animals, smaller animals, fungus and bacteria, until they are made part of the soil again. But as this happens, these nutrients are rapidly absorbed with water into tree roots. Nothing is wasted. A large, dead okapi (an elk-sized antelope) will completely disappear in less than two weeks!

We have really only begun to learn about tropical rainforests!

# RAINFOREST VOCABULARY REVIEW

**DIRECTIONS:**
Fill in the missing terms that match the definitions below. Then circle them in the wordfind.

```
T R O P I C A L R A I N F O R E S T A R
C F I A V Q K A N Z S W E H R J M B H I
S B R S U N D E R S T O R Y K U J F G Z
I Z V O U I O N X R B A D F R S Q Q E D
A S T C N E M H E N L O C I E R T S I A
M Q U I B N A S E T Y H P I P E T X G J
B D I M U H K O U A Y L L L U C E U Q T
I F J Z T J I T A D P D R E O N O F O A
H O A W T A T C T A O E O E B A R A T P
B R R R R L C H O R N D G C A C A O E E
E E A L E O S G C V A T X L L F R C O Q
T S W W S R B N E V C Q T G E O A M I U
Q T Q E S D W O R S E A X E Q C I N U A
F F B N R O C I R P A C F O C I P O R T
L L J C O B R T T T D K O W O P N I L O
F O G Q O U E A P H D E R A F O E D A R
B O O Z T H I V I X C W P Z G R N A L E
C R C S S E R E U S N O I T A T P A D A
O L F B Q I N L J B O U P M I D L E P O
T N E G R E M E H H Q W O R I I Z E B O
```

1. Most plant and animal species live here

2. Tropic of the southern hemisphere

3. This word describes moist air

4. The bottom of the rainforest

5. Tropic of the northern hemisphere

6. Huge roots of emergents

7. Height of land above sea level

8. Rainforest's layer of life

9. This divides the hemispheres

10. Hanging plants

11. Rainforest layer below canopy

12. "Chocolate plant"

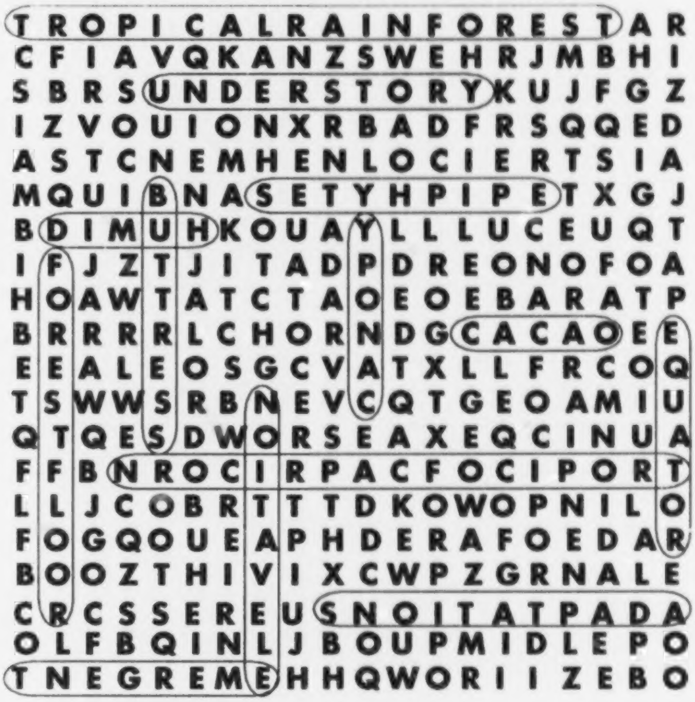
13. Body parts that help living things survive

14. Tallest rainforest trees

# RAINFOREST VOCABULARY REVIEW

## Answer Key

**DIRECTIONS:**
Fill in the missing terms that match the definitions below. Then circle them in the wordfind.



T R O P I C A L R A I N F O R E S T A R
C F I A V Q K A N Z S W E H R J M B H I
S B R S U N D E R S T O R Y K U J F G Z
I Z V O U I O N X R B A D F R S Q Q E D
A S T C N E M H E N L O C I E R T S I A
M Q U I B N A S E T Y H P I P E T X G J
B D I M U H K O U A Y L L L U C E U Q T
I F J Z T J I T A D P D R E O N O F O A
H O A W T A T C T A O E O E B A R A T P
B R R R R L C H O R N D G C A C A O E E
E E A L E O S G C V A T X L L F R C O Q
T S W W S R B N E V C Q T G E O A M I U
Q T Q E S D W O R S E A X E Q C I N U A
F F B N R O C I R P A C F O C I P O R T
L L J C O B R T T T D K O W O P N I L O
F O G Q O U E A P H D E R A F O E D A R
B O O Z T H I V I X C W P Z G R N A L E
C R C S S E R E U S N O I T A T P A D A
O L F B Q I N L J B O U P M I D L E P O
T N E G R E M E H H Q W O R I I Z E B O

1. Most plant and animal species live here
*(tropical rainforest)*
2. Tropic of the southern hemisphere
*(Tropic of Capricorn)*
3. This word describes moist air
*(humid)*
4. The bottom of the rainforest
*(forest floor)*
5. Tropic of the northern hemisphere
*(Tropic of Cancer)*
6. Huge roots of emergents
*(buttress roots)*
7. Height of land above sea level
*(elevation)*
8. Rainforest's layer of life
*(canopy)*
9. This divides the hemispheres
*(equator)*
10. Hanging plants
*(epiphytes)*
11. Rainforest layer below canopy
*(understory)*
12. "Chocolate plant"
*(cacao)*
13. Body parts that help living things survive
*(adaptations)*
14. Tallest rainforest trees
*(emergent)*

# ON THE SAVANNAH

## Teacher Information

### OBJECTIVES:

Students will demonstrate the ability to
- locate African Savannah on a map of Africa
- understand the savannah's climatic conditions
- understand the basic ecology of the savannah

SCIENCE CCG's
CONCEPTS: 1.1 - 1.8, 1.10 - 1.12, 1.14
PROCESSES: 2.6, 2.12, 2.15

### VOCABULARY:

Africa, alates, bivouac, browse, carrion, drought, evaporation, extinction, fertilize, graze, habitat, herbivore, malaria, migrate, poaching, predator, prey, scavenger, species.

### MATERIALS:

- "On The Savannah" student texts
- "Savannah Vocabulary Review" worksheets.

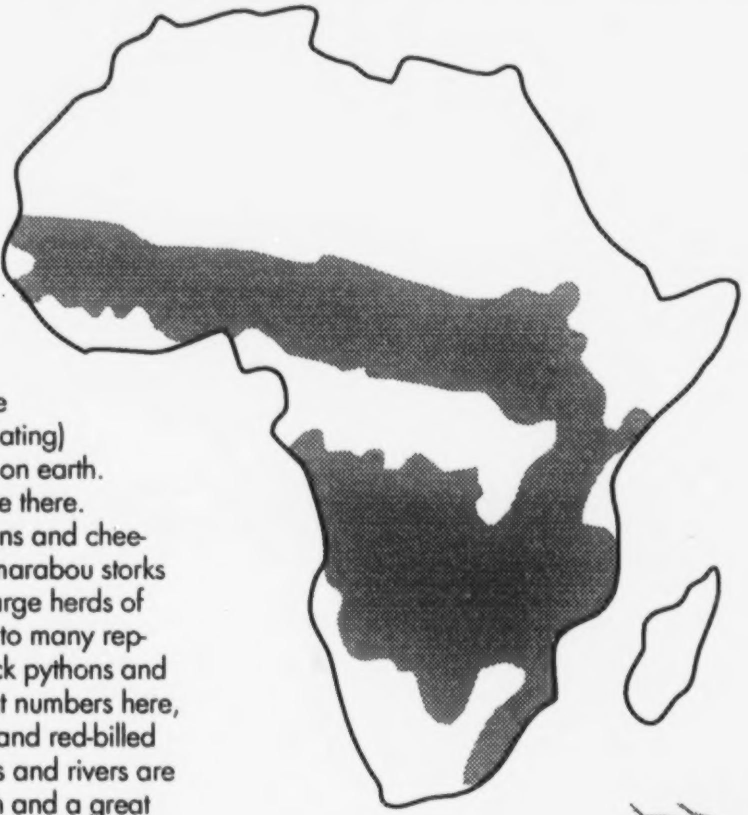
### ACTIVITY DIRECTIONS:

1. Introduce and/or review vocabulary words above with your students.
2. Read "On The Savannah" together, aloud as a class, stopping to discuss and clarify along the way.
3. Assign your students "Savannah Vocabulary Review" worksheets.

# ON THE SAVANNAH

Imagine you are camping out under a scrubby, old tree. You're surrounded by endless plains of grass twice as tall as you! A few trees and shrubs break out of the grasses here and there, and there's a small, shallow lake nearby. The night air is cooling fast, and you fall asleep to the sounds of a few singing birds. It's as if you are all alone on the earth. The next morning you awaken to find yourself surrounded by herds of grazing animals so vast you can't see the end of it all! Zebra, impala, wildebeest, springbok, eland, and flocks of birds have practically covered the lake and its edges. You could only be on the African Savannah.

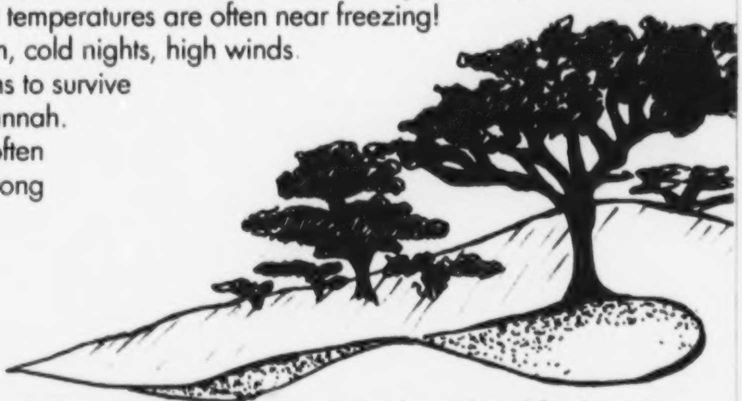
Savannah is mostly grasslands, with some trees and shrubs. The map below shows African Savannah as shaded area. Savannah covers huge areas of Africa, south of the Sahara Desert. Can you find the savannah?



The African Savannah has more species of herbivorous (plant - eating) mammals than any other place on earth. Over 70 species of antelope live there. There are predators, such as lions and cheetahs, and scavengers, such as marabou storks and hyenas, who feed on the large herds of herbivores. Savannah is home to many reptiles such as monitor lizards, rock pythons and tortoises. Birds also live in great numbers here, such as ostriches, cattle egrets, and red-billed quelea. Shallow lakes, swamps and rivers are home to African lungfish, catfish and a great variety of cichlids (a family of tropical fish), and the giant bullfrog. There are insects...flies, mosquitoes, ants, termites, locust and many others. They are an important source of food to many animals.

## THE LAND

Savannah is simpler than tropical rainforest. There are fewer different species, but often there are huge numbers of each species. The rainy and dry seasons are both about six months long. Many animals migrate during the dry season to find food and water. Days are hot, often 100 degrees Fahrenheit or more. Yet night temperatures are often near freezing! Plants and animals must endure hot sun, cold nights, high winds, dust, hard rains and very dry conditions to survive there. Drought is common on the savannah. Drought occurs when rains don't fall, often for several years or more. Only the strong and the lucky survive long droughts.



Fire is a natural part of savannah life. Lightning starts fires that burn quickly through the tall, dry grasses and trees, with flames as high as 30 feet. Fire helps many seeds to sprout and grow. It clears the soil and fertilizes it with ash. Many plants depend on fire to reproduce. People have raised cattle on the savannah for centuries. They have burned the savannah to help new grasses grow. Both cattle and wildlife have enjoyed the benefits of fire. Without fire, trees can slowly take over in some savannah.

## WATER

Savannah is mostly dry, with some shallow lakes, swamps, and rivers. Some are permanent, but others evaporate in the dry season. The swamps don't burn in the fires because they are so wet. So their dead plant matter piles up above the wet ground. This blocks sunlight and helps to keep the swamp from drying up. Many animals can survive with very little water. Gazelles get almost all of their water from the grasses they eat. Other animals, like the hippopotamus, need water to live in part of each day. Most animals need to come to the water every day to drink. This is why so many animals gather near water during the dry season.

## INSECTS

Insects play a huge role in the life of the savannah. Burrowing insects such as ants and termites help to fertilize the soil, as earthworms do in our soils. They dig many deep holes that allow air, water, other animals and plant roots to enter the soil. They also fertilize it with their wastes. Insects are also food to birds, frogs, lizards, snakes, fish, and many mammals, including humans. Termite alates (winged termites—these will be the kings and queens of new colonies) are large, about half protein and half fat. They are roasted and taste like peanut butter. They are a favorite food of many tribes.

Termites eat wood and plants, and can live in colonies of a million or more. They build air-conditioning chimneys out of mud, up to 30 feet tall. Some animals, such as the dwarf mongoose, use the chimneys for shelter.

Savannah ants usually live in groups of several hundred. Some species live in colonies underground. Some, like soldier ants, have no home. They hunt for food in large numbers by day. They build a nest out of their own bodies called a bivouac, hanging from a branch. Most African ants have nasty bites!

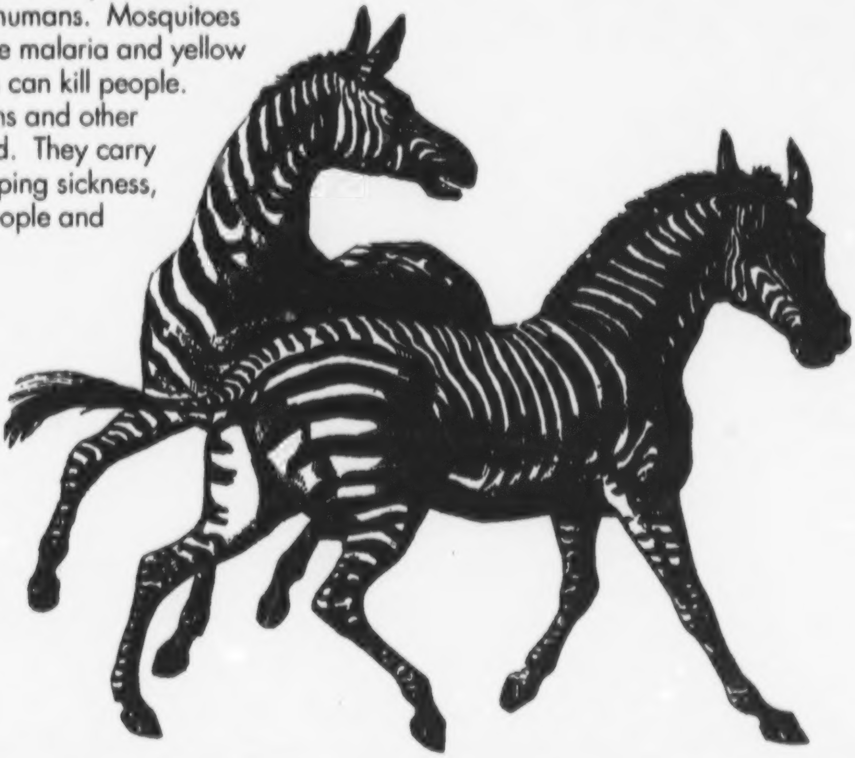
Locust are like large grasshoppers. They can travel in swarms of ten million, and move 2,000 miles in one season. Each locust eats its own weight in plants every day. Locusts swarm so thick that they look like a dark cloud. It's hard to breathe when they fill the air. When they are gone, so are all of the plants.

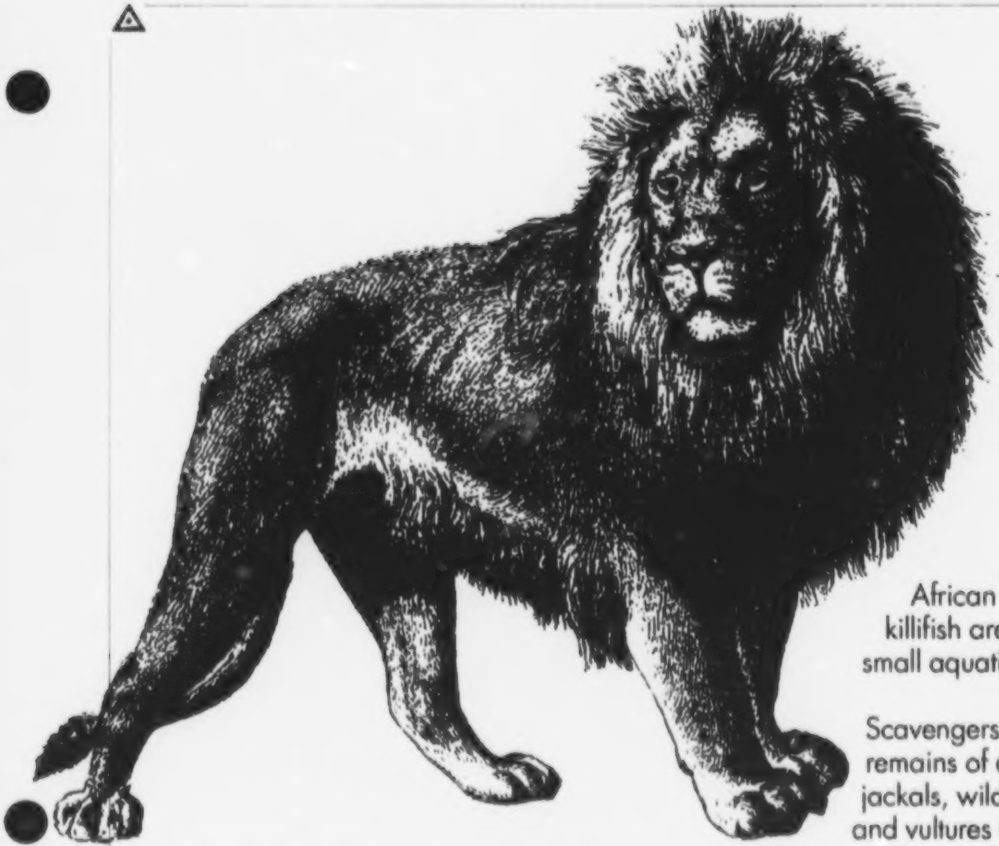
The mosquito and the tsetse fly are the most dangerous insects to humans. Mosquitoes carry germs that cause malaria and yellow fever. These diseases can kill people. Tsetse flies bite humans and other animals to drink blood. They carry germs that cause sleeping sickness, which can also kill people and cattle.

## HERDS

If the great herds of the savannah all ate the same food at the same time in the same place, they could not all survive. Instead they have adapted special eating habits that keep them from competing with each other.

In a large mixed herd, some species are grazers and others are browsers. Grazers, like the impala and zebra, eat mostly grasses. Browsers, like the black rhinoceros and dik dik, eat leaves and stems of shrubs and trees. Some, like elephants, do both. Most animals will do both in a food shortage. Some species eat the same plants but live in different habitats, like the wildebeest and the buffalo. Some eat the same plants but during different seasons, like gazelles and impala. Some eat different parts of the same plant. Giraffes eat from treetops, while black rhinos must forage lower to the ground.





## PREDATORS AND SCAVENGERS

Predators hunt, kill and eat prey, and there is plenty of prey on the savannah. Most predators are found near water because their prey must visit water regularly. Lions are probably the best known of the mammals. Cheetahs, servals, caracals, hyenas, wild dogs and many other mammals hunt other animals for food. Nearly all savannah reptiles are predatory including: crocodiles, chameleons, monitor lizards, spitting cobras and bull pythons. Predatory birds such as Hottentot teals, yellow-billed storks, African white spoonbills, and grey-headed kingfishers, live near the water. African lungfish, catfish and killifish are predators, too, eating small aquatic animals.

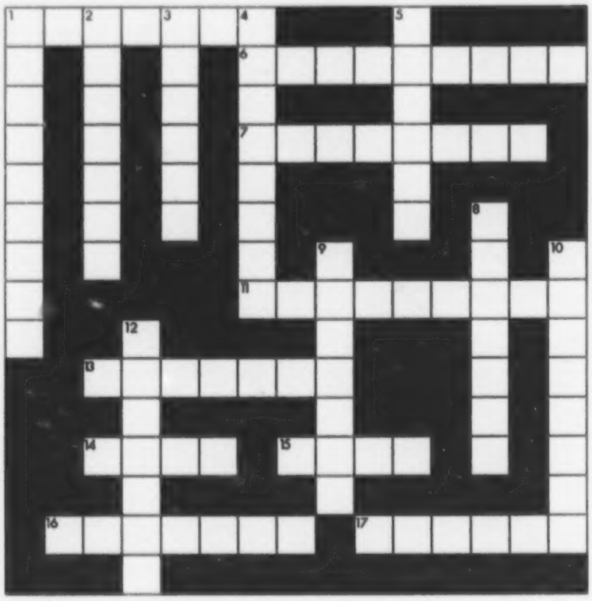
Scavengers eat carrion, which is the remains of dead animals. Hyenas, jackals, wild dogs, marabou storks and vultures are all scavengers. But so are lions, who will wait for other predators to make kills, and then steal a meal. Lions kill the largest prey, but spotted hyenas kill more animals than any other savannah predators. Hyenas actually eat far more of their own kills than they do scavenged meals.

## PEOPLE OF THE SAVANNAH

Savannah wildlife are threatened more and more by people. Poaching (illegal hunting) is driving some species to near extinction, like the black rhinoceros. Loss of habitat is a greater threat to all of the wildlife, as more people bring farms and cattle to the savannah. It will take a great deal of planning and effort to save enough habitat to keep wildlife alive into the future, and still provide for the people of the savannah.

# SAVANNAH VOCABULARY REVIEW

**DIRECTIONS:**
Use the clues to fill in the numbered blanks in the puzzle below.



## CLUES

### ACROSS

1. Area that provides an animal's needs
6. To change from liquid to gas
7. Insect that spreads malaria
11. Any animal that eats dead animals
13. Grassy plains of Africa
14. Any hunted animal
15. A natural force of change in the savannah
16. Eater of leaves, twigs, stems, branches, etc.
17. Eater of grasses

### DOWN

1. Any plant - eating animal
2. Soldier ant nest
3. Fly that spreads sleeping sickness
4. They eat wood and plants
5. Grasshopper-like insect
8. Move with the seasons to find food
9. Disease spread by mosquitoes
10. Any hunting animal
12. Dead animal remains

# SAVANNAH VOCABULARY REVIEW

## Answer Key

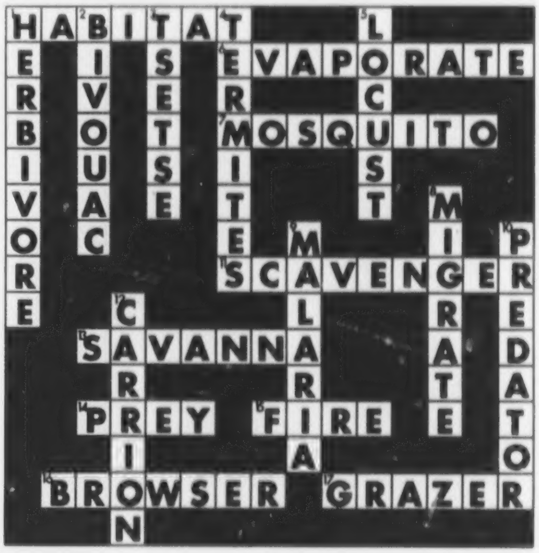
### CLUES

### ACROSS

1. Area that provides an animal's needs *(habitat)*
6. To change from liquid to gas *(evaporate)*
7. Insect that spreads malaria *(mosquito)*
11. Any animal that eats dead animals *(scavenger)*
13. Grassy plains of Africa *(savannah)*
14. Any hunted animal *(prey)*
15. A natural force of change in the savannah *(fire)*
16. Eater of leaves, twigs, stems, branches, etc. *(browser)*
17. Eater of grasses *(grazer)*

### DOWN

1. Any plant - eating animal *(herbivore)*
2. Soldier ant nest *(bivouac)*
3. Fly that spreads sleeping sickness *(tse tse)*
4. They eat wood and plants *(termites)*
5. Grasshopper-like insect *(locust)*
8. Move with the seasons to find food *(migrate)*
9. Disease spread by mosquitoes *(malaria)*
10. Any hunting animal *(predator)*
12. Dead animal remains *(carrion)*


HABITAT
EVAPORATE
MOSQUITO
SCAVENGER
SAVANNA
PREY
FIRE
BROWSER
GRAZER
HERBIVORE
BIVOUAC
TSETSE
TERMITE
LOCUST
MIGRATE
PREDATOR
MALARIA
CARRION

# WET AND DRY

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify different climates in Africa and color a climate map.

Social Studies CCG's: 3.5, 6.1, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1.

### VOCABULARY:

- climate
- arid climate
- semiarid climate
- tropical climate

### MATERIALS:

- Maps of Africa.
- Copies of the student directions for Wet and Dry 3rd-5th Grade, page 71.

### ACTIVITY DIRECTIONS:

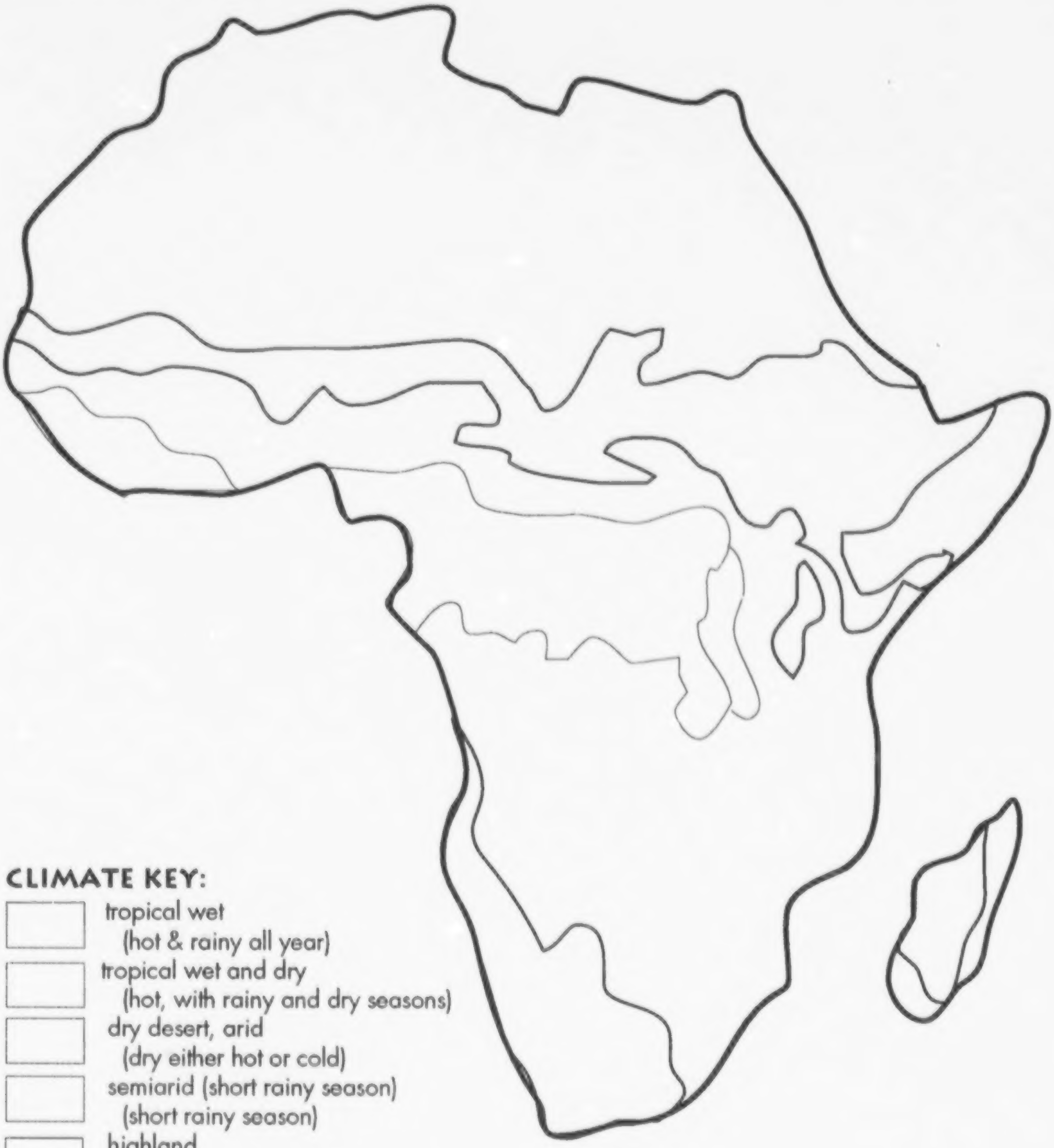
- Teach activity vocabulary.
- Teach students how to create a map key using colors or shading.
- Have students work individually or in groups to color the climate areas indicated on the outline map using a climate map of Africa.
- Have individuals or groups share their answers and make corrections.

### ENRICHMENT:

- Write a description of one of Africa's climate regions.
- Research a country located in one of the climate regions.

# WET AND DRY

Create a map key and color the climate regions shown on the map of Africa, using resources and climate maps of Africa.



**CLIMATE KEY:**

☐ tropical wet (hot & rainy all year)

☐ tropical wet and dry (hot, with rainy and dry seasons)

☐ dry desert, arid (dry either hot or cold)

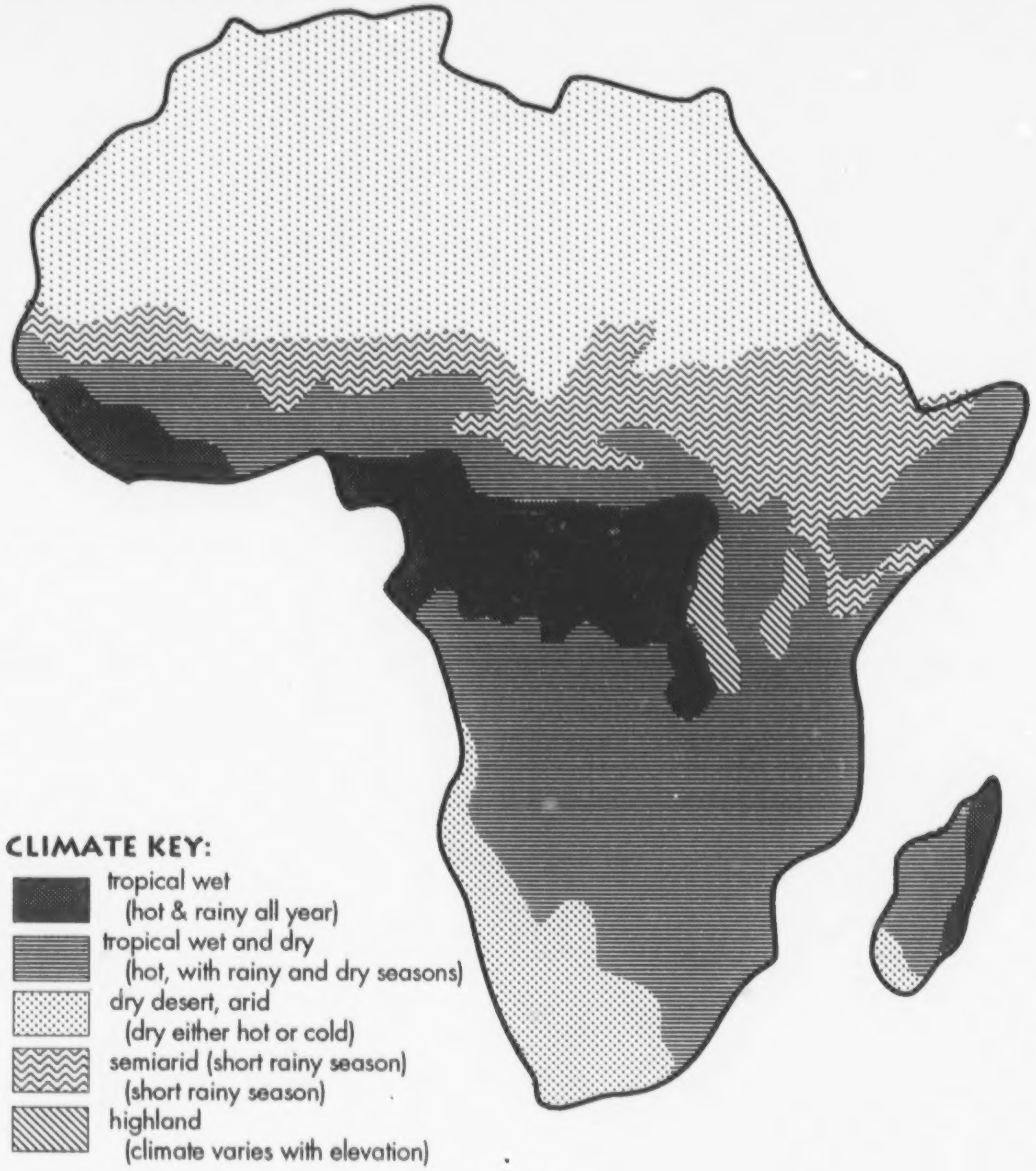
☐ semiarid (short rainy season) (short rainy season)

☐ highland (climate varies with elevation)

# WET AND DRY

## Answer Key

Create a map key and color the climate regions shown on the map of Africa, using resources and climate maps of Africa.


CLIMATE KEY:
tropical wet (hot & rainy all year)
tropical wet and dry (hot, with rainy and dry seasons)
dry desert, arid (dry either hot or cold)
semiarid (short rainy season) (short rainy season)
highland (climate varies with elevation)

# AFRICA'S RAINFORESTS

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate rainforests of Africa on a map.

Social Studies CCG's: 3.5, 6.1, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1.

### MATERIALS:

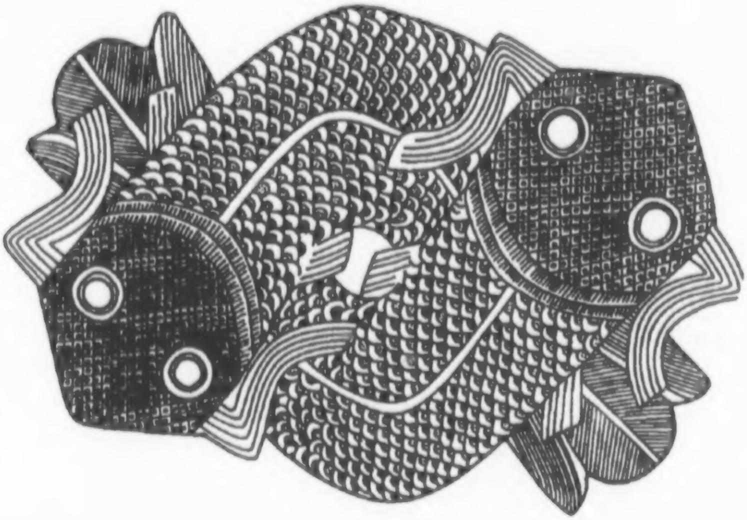
- Climate maps of Africa.
- Copies of the outline map of Africa.
- Copies of the student directions for Africa's Rainforests.

### ACTIVITY DIRECTIONS:

- Review procedures for creating a map key.
- Have students work individually or in groups to complete the activity using a climate map of Africa or other resources.
- Have individuals or groups share their maps.

### ENRICHMENT:

- Have students make a map of Africa on a bulletin board showing rainforests.
- Identify countries in which the rainforests are located.

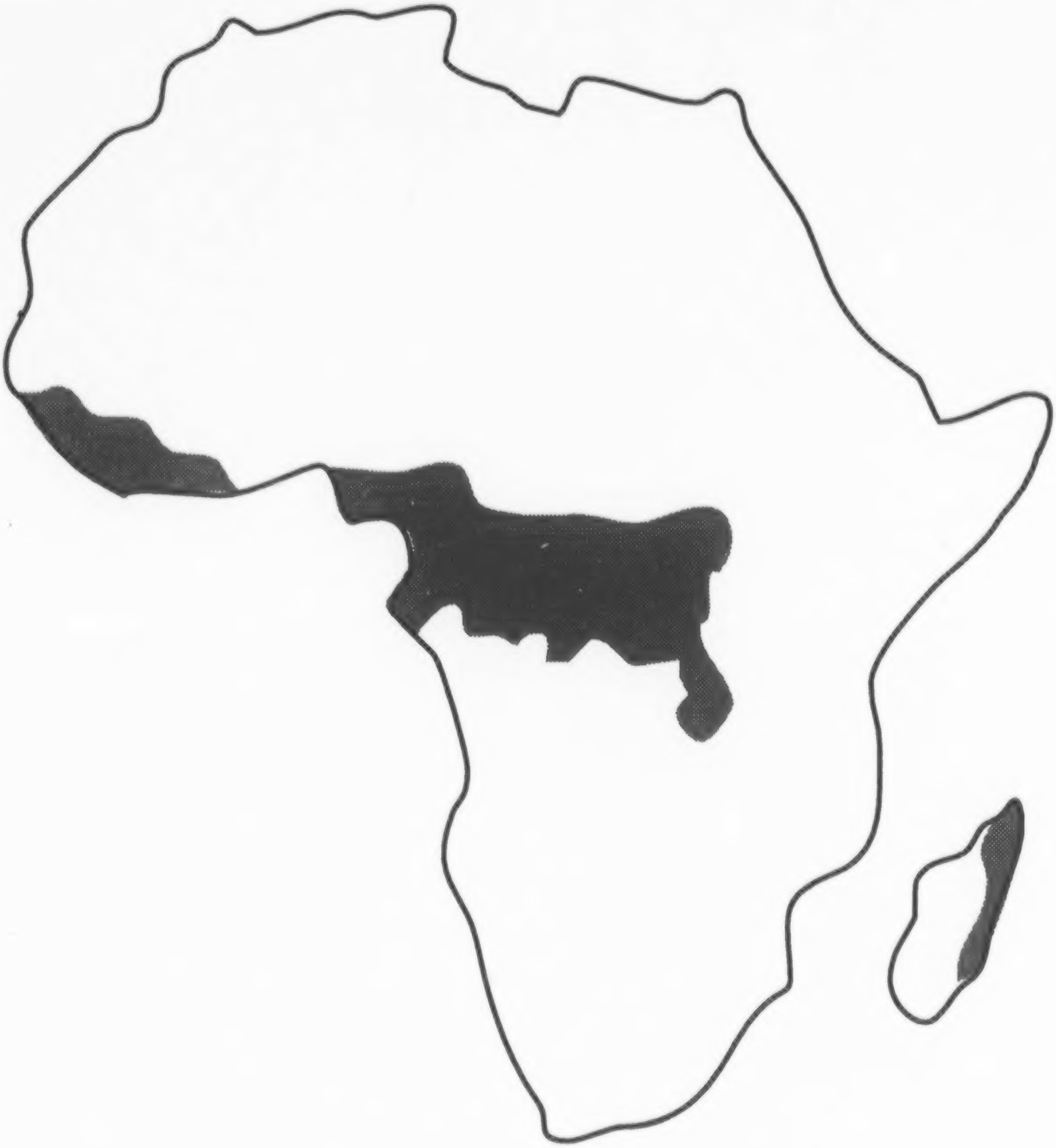


# AFRICA'S RAINFORESTS

Using resources and maps of Africa, identify the location of rainforests in Africa. Color an outline map to show their location.

# AFRICA'S RAINFOREST S

## Answer Key



# CLIMATE COMPARISON

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will gather data about the climate of their area and compare it with the climate of a rainforest.

Social Studies CCG's: 3.5, 6.1, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1.

### ACTIVITY DIRECTIONS:

- Gather data about the climate (temperature and rainfall) of your area or use the information about the Portland, Oregon area that is included.
- Students should graph the data.
- Students graph the data from the rainforest.
- Compare and contrast the data by analyzing the graphs.

### ENRICHMENT:

- Select other data to compare.
- Create maps of rainforest climate and the climate of your area.
- Contact George Taylor, Oregon State Climatologist at (503) 737-5705 for additional climate information.

# CLIMATE COMPARISON

## ACTIVITY DIRECTIONS:

- Gather data about the climate (temperature and rainfall) of your area or use the information about Portland, Oregon area that is included.
- Decide how best to graph the data.
- Graph the data.
- Compare and contrast the data by analyzing the graphs.

### Average Temperature in a Rainforest

| | |
|---|---|
| January | 79 degrees |
| February | 79 degrees |
| March | 80 degrees |
| April | 80 degrees |
| May | 80 degrees |
| June | 81 degrees |
| July | 81 degrees |
| August | 82 degrees |
| September | 79 degrees |
| October | 79 degrees |
| November | 78 degrees |
| December | 78 degrees |

### Average Temperature in Portland, OR

| | |
|---|---|
| January | 38.9 degrees |
| February | 43.2 degrees |
| March | 45.9 degrees |
| April | 50.4 degrees |
| May | 56.7 degrees |
| June | 62.5 degrees |
| July | 67.7 degrees |
| August | 67.3 degrees |
| September | 62.7 degrees |
| October | 54.3 degrees |
| November | 45.5 degrees |
| December | 40.9 degrees |

### Average Temperature in Your Area

January .............................. _____degrees
February .......................... _____degrees
March ................................ _____degrees
April .................................. _____degrees
May ................................... _____degrees
June .................................. _____degrees
July ................................... _____degrees
August .............................. _____degrees
September ........................ _____degrees
October ............................ _____degrees
November ......................... _____degrees
December .......................... _____degrees

### Average Rainfall in a Rainforest

| | |
|---|---|
| January | 25 inches |
| February | 20 inches |
| March | 13 inches |
| April | 11 inches |
| May | 10 inches |
| June | 7 inches |
| July | 8 inches |
| August | 9 inches |
| September | 10 inches |
| October | 11 inches |
| November | 14 inches |
| December | 18 inches |

### Average Rainfall in Portland, OR

| | |
|---|---|
| January | 6.2 inches |
| February | 3.9 inches |
| March | 3.6 inches |
| April | 2.3 inches |
| May | 2.1 inches |
| June | 1.5 inches |
| July | 0.5 inches |
| August | 1.1 inches |
| September | 1.6 inches |
| October | 3.1 inches |
| November | 5.2 inches |
| December | 6.4 inches |

### Average Rainfall in Your Area

January .............................. _____inches
February .......................... _____inches
March ................................ _____inches
April .................................. _____inches
May ................................... _____inches
June .................................. _____inches
July ................................... _____inches
August .............................. _____inches
September ........................ _____inches
October ............................ _____inches
November ......................... _____inches
December .......................... _____inches

# RAINFALL / HABITAT PUZZLE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate four cities on an outline map of Africa based on information given in a rainfall chart.

Social Studies CCG's: 3.5, 6.1, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1.

### VOCABULARY:

- rainforest
- desert shrub
- savannah

### MATERIALS:

- Maps of Africa.
- Copies of the outline map of Africa.
- Copies of the student directions for Rainfall/Habitat Puzzle.

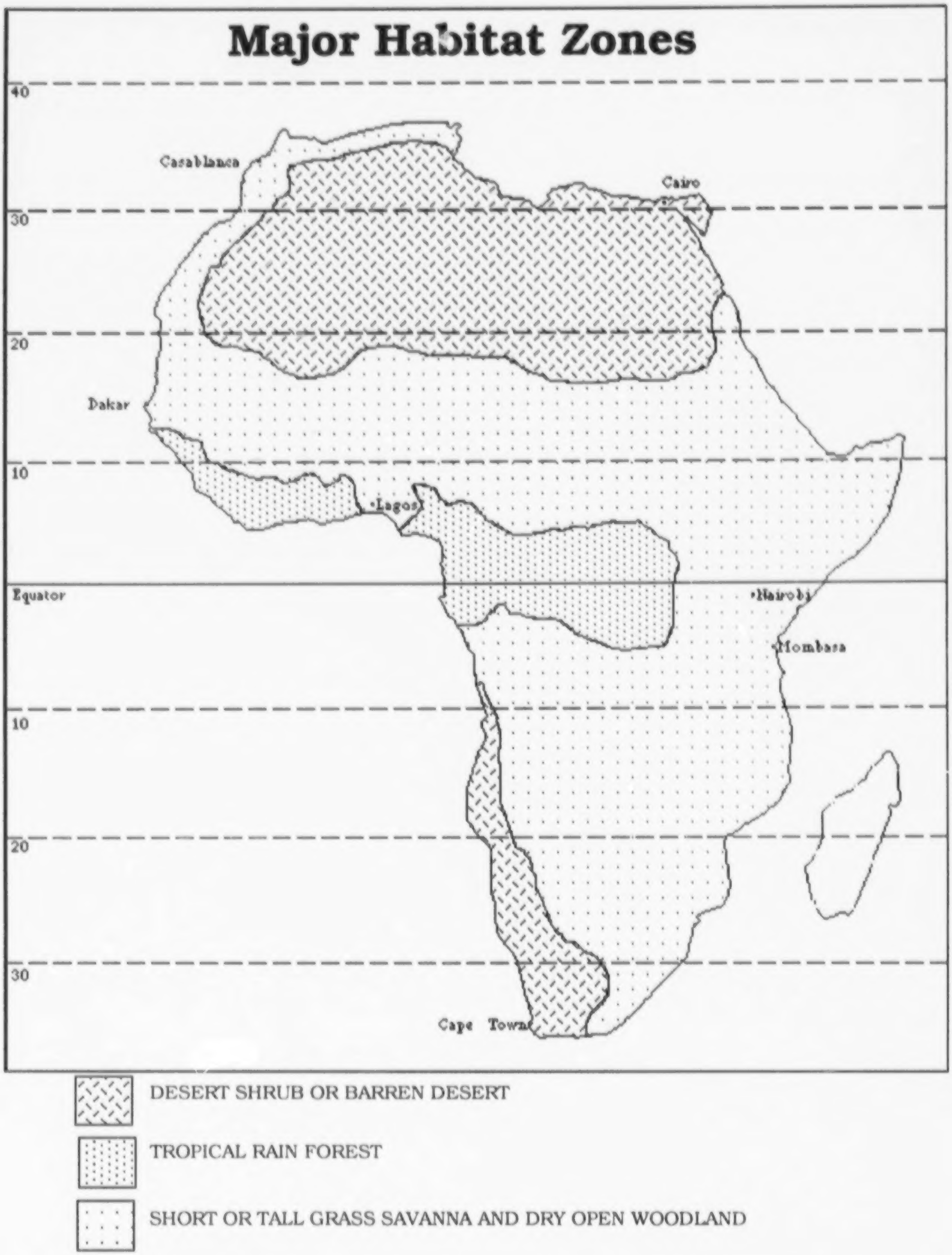
### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- PREDICTING HABITATS-Students apply rainfall/habitat vocabulary information to some specific locations.
- Have students create a bar or line graph for each city. (Graphs will show obvious wet and dry spells for cities B and D.)
- WHICH CITY IS WHERE?-Use a climate map and the climate chart to decide which city is where, and label the four cities on the attached map.
- PREDICTING HABITAT ZONES-Students should be able to predict where different habitats can be found using rainfall maps. (A related activity is Wet and Dry)

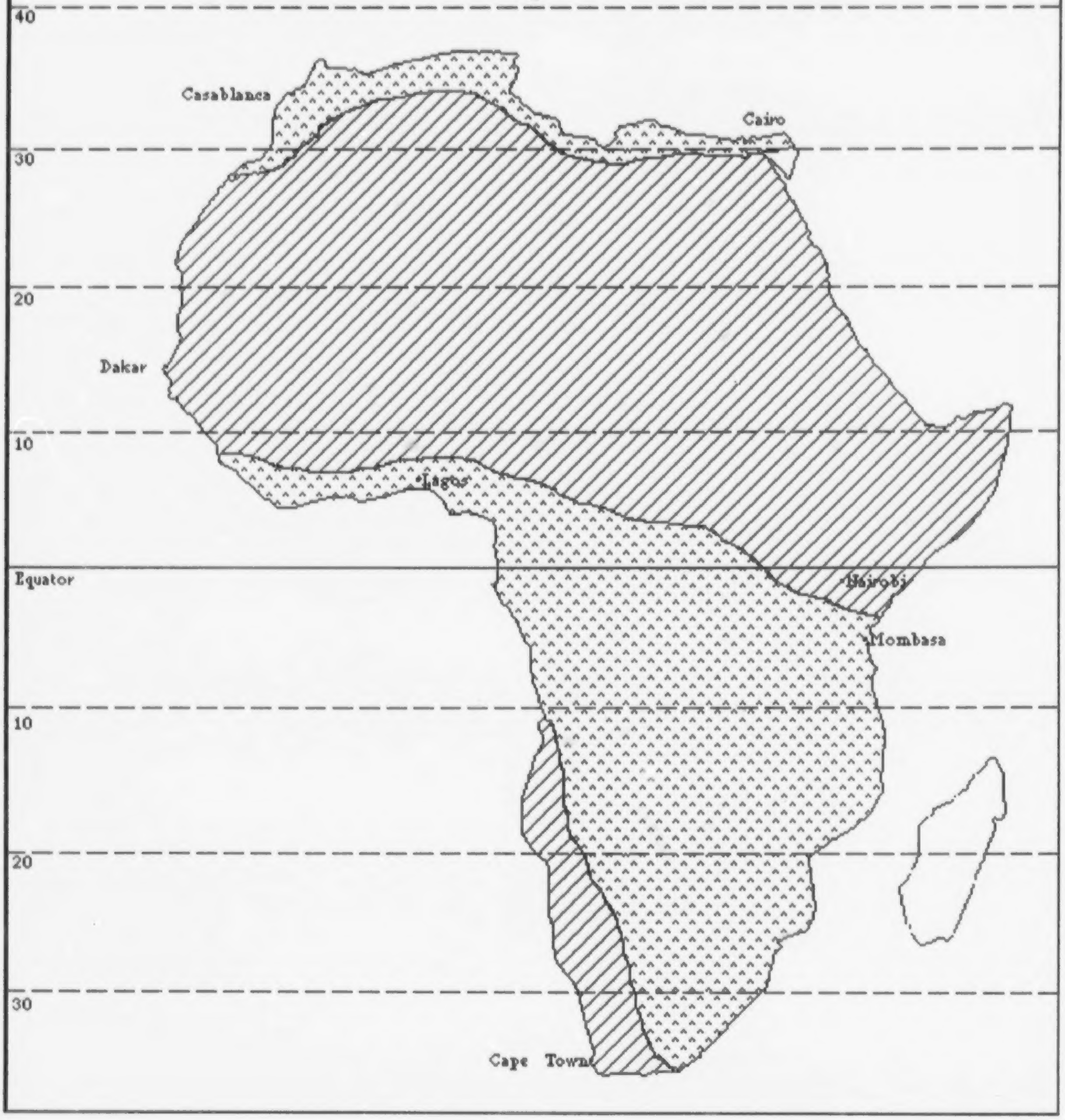
### ENRICHMENT:

- Conduct a discussion with students about the things animals and people have to cope with in each habitat zone.
- Would the same animals be found in each area?
- What challenges would the animals and people face in a region that has dry and wet seasons?

# Major Habitat Zones


40
30
20
10
Equator
10
20
30
Casablanca
Cairo
Dakar
Lagos
Nairobi
Mombasa
Cape Town
DESERT SHRUB OR BARREN DESERT
TROPICAL RAIN FOREST
SHORT OR TALL GRASS SAVANNA AND DRY OPEN WOODLAND

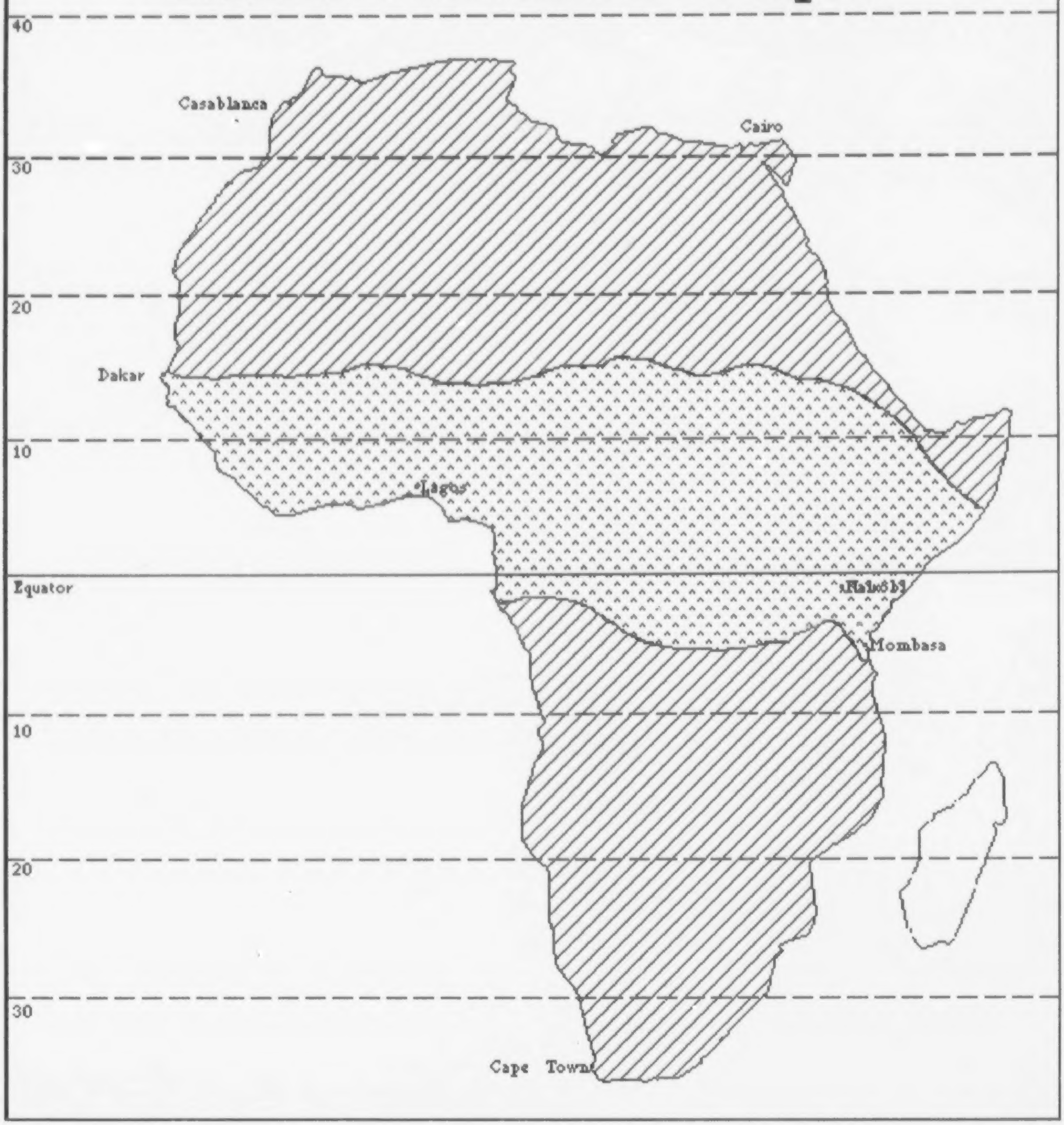
# Rainfall: May to October


40
Casablanca
Cairo
30
20
Dakar
10
Lagos
Equator
Nairobi
Mombasa
10
20
30
Cape Town

▨ 20 to 80 inches in six months

▨ Zero to 15 inches in six months

# Rainfall: November to April


40
Casablanca
Cairo
30
20
Dakar
10
Lagos
Equator
Nairobi
Mombasa
10
20
30
Cape Town

░ 20 to 80 inches in six months

▨ Zero to 15 inches in six months

# RAINFALL / HABITAT PUZZLE

There are three main kinds of habitat in Africa. Each habitat has a typical rainfall pattern. These habitats can be described as follows:

**RAINFOREST**-moderate to heavy rainfall every month of the year.
**DESERT SAVANNAH**-low rainfall every month of the year.
**SAVANNAH**-a six month rainy season and a six month dry season each year.

## PREDICTING HABITATS

Here are the average monthly rainfall figures, in inches, for four cities in Africa. Rainfall for Portland, Oregon is provided for comparison.

| **Monthly Rainfall** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **City A** | 4 | 4 | 4 | 5 | 14 | 20 | 8 | 7 | 7 | 7 | 8 | 4 |
| **City B** | 10 | 10 | 13 | 13 | 5 | 1 | 0 | 1 | 3 | 4 | 15 | 10 |
| **City C** | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 4 |
| **City D** | 2 | 1 | 1 | 1 | 6 | 22 | 51 | 42 | 27 | 15 | 5 | 1 |
| **Portland** | 6 | 5 | 5 | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 6 | 7 |

Based on the information you have about habitats, analyze the rainfall data and predict what kind of habitat you would expect to find around each city. Graphing is one way to analyze the data.

## HABITAT PREDICTION

City A ____________________
City B ____________________
City C ____________________
City D ____________________

## WHICH CITY IS WHERE?

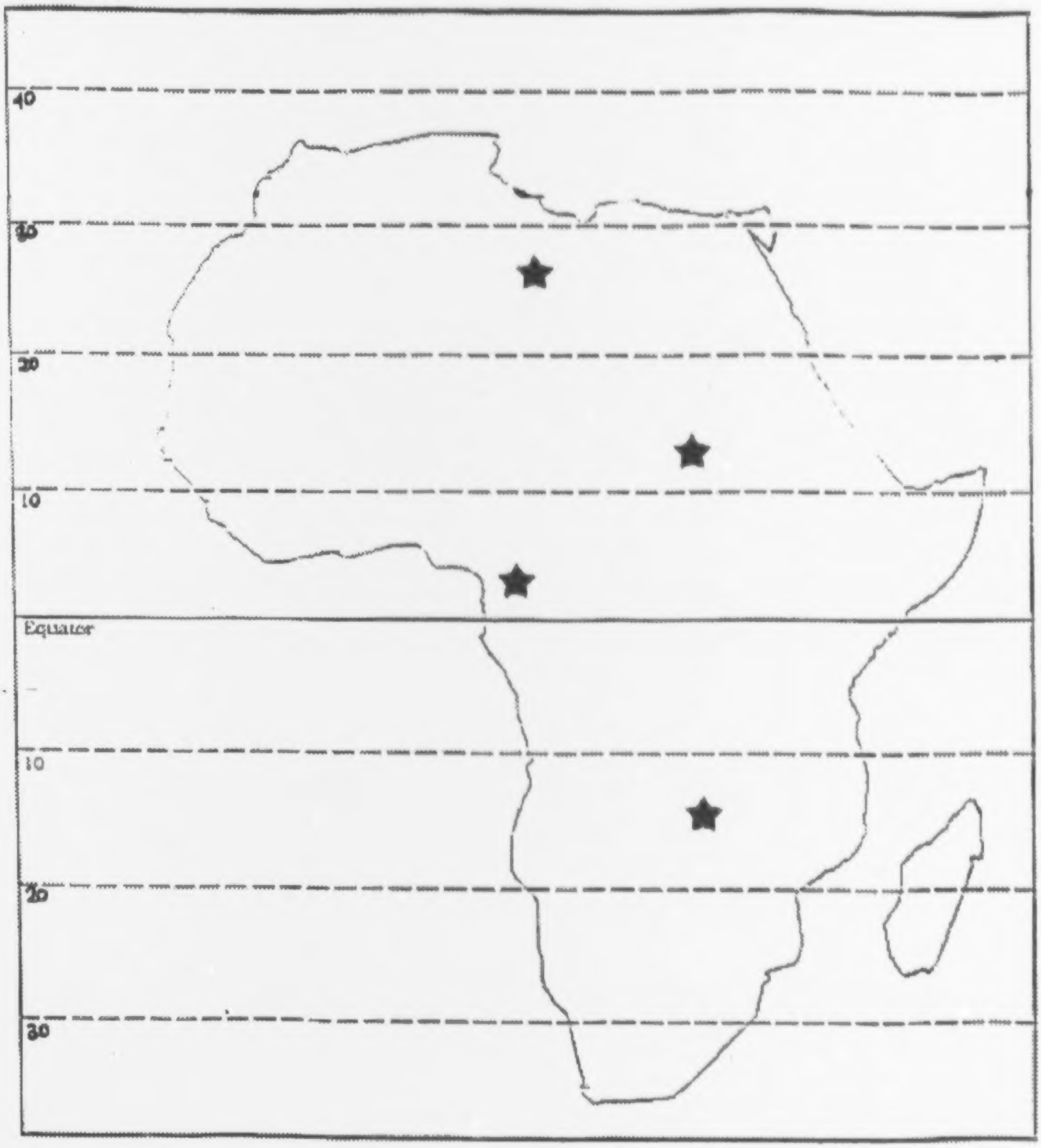
The map on the following page has four stars on it. Study a rainfall map and decide which of the four cities, A, B, C, and D is located at each star and label the cities on the map.

## PREDICTING HABITAT ZONES

Using the rainfall maps, predict the kind of habitat that you would expect to find in different areas of the continent. Shade the continent using a different color for each habitat.

# RAINFALL / HABITAT PUZZLE

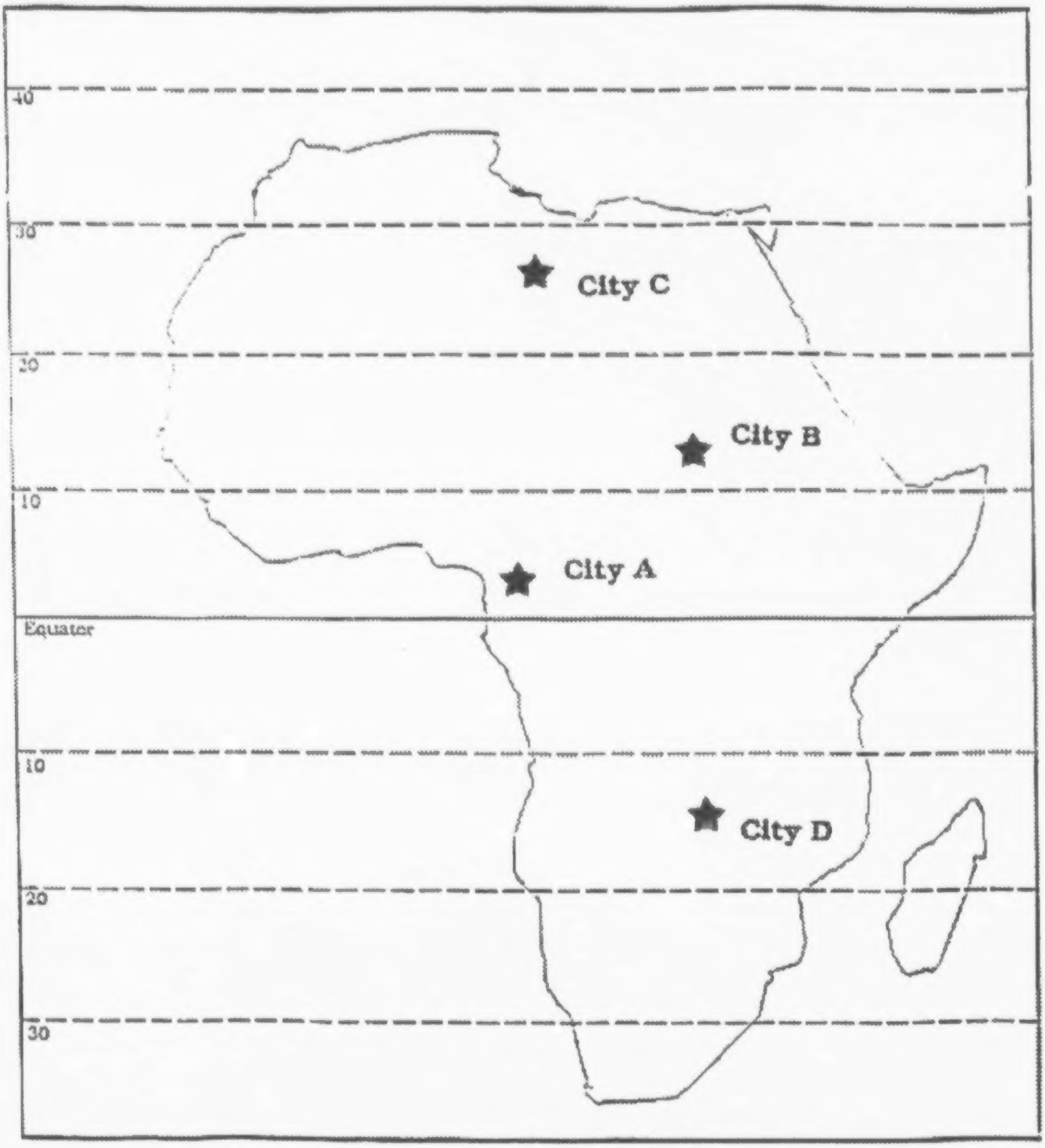
AFRICA


40
30
20
10
Equator
10
20
30

# RAINFALL / HABITAT PUZZLE

## Answer Key

AFRICA


40
30
20
10
Equator
10
20
30
City C
City B
City A
City D

# A DAY IN MY LIFE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify environmental characteristics in each of the habitats of the African Exhibit.

Social Studies CCG's: 6.1, 6.2, 6.4, 7.3, 7.4, 8.1.

### VOCABULARY:

- savannah
- rainforest
- arid
- tropical

### MATERIALS:

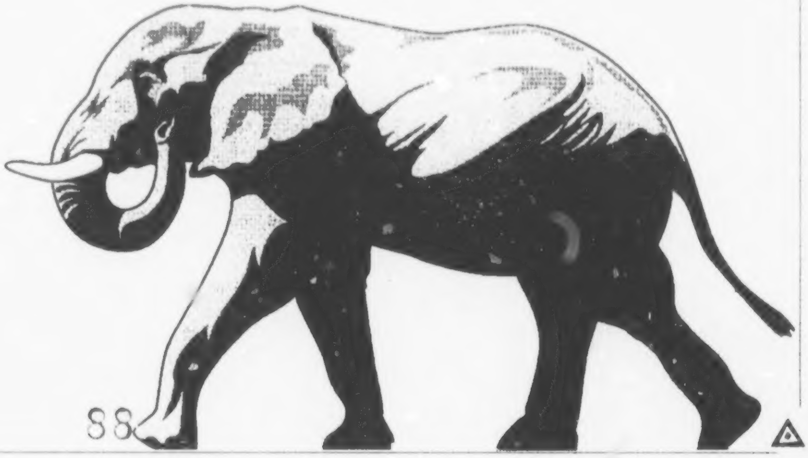
- copies of the descriptive writing activity.
- pencils/pens

### ACTIVITY DIRECTIONS:

- Review the directions for completing the descriptive writing activity prior to the zoo field-trip.
- Have students work individually to complete the pre-writing activity.
- Have students write a descriptive piece back at school.

### ENRICHMENT:

- Have individuals share their stories.
- Students could illustrate their writing piece and publish it for others to read.
- Students could create a play enacting their story, and present it to their classmates.



# A DAY IN MY LIFE

Choose either the savannah or rainforest in the Africa Exhibit. Imagine yourself living in this environment. Write descriptive words to tell about where you live and what you do. Include information about the animals and plants in your environment (based on your studies of the savannahs and rainforests).

Environment:____________________

| **Environment** | **Climate** | **Animals** | **Plants** |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## BACK AT SCHOOL

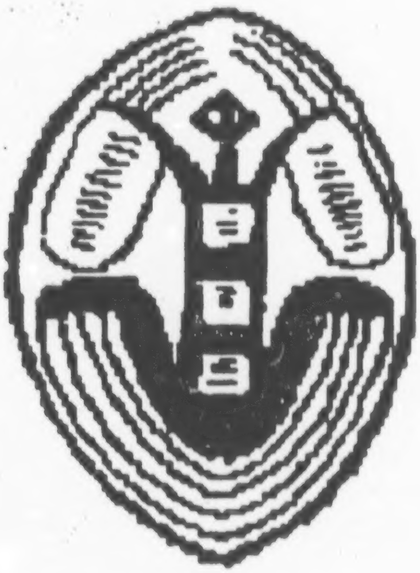
Write a story about a day in your life in this environment. Include as many of the words that you listed above. Revise and edit your story. Illustrate and publish your story and share it with your classmates.

# A DIVERSE CAST OF PLAYERS

## GRADES 3-5

A Diverse Cast of Players gives students an opportunity to learn more about the animals and people of the African rainforests and savannah regions. Science skills of observation and classification are emphasized. Students also get a glimpse of the culture of the people by learning about proverbs and folkart forms of Africa.

The activities from this section are described below:



### AN AFRICAN TROPICAL RAINFORESTS' WHO'S WHO*

- Students use references to identify silhouettes of rainforest animals.

### SOFLI, SOFLI CATCH A MONGKI*

- Students explore proverbs from Africa and other countries.

### FOLK ART OF AFRICA

- Students copy designs of Africa folkart.

It is recommended to look at the activities in the 6th-8th Grade Level for other activities to adapt for these levels.

# AN AFRICAN TROPICAL RAINFOREST "WHO'S WHO"

## Teacher Information

### OBJECTIVES:

Students will demonstrate
- knowledge of African tropical rainforest animals and which forest layers they live in.
- referencing skills.

CONCEPTS: 1.5, 1.10, 1.12, 1.14
PROCESSES: 2.1, 2.6, 2.12, 2.15

### VOCABULARY:

canopy, emergent, forest floor, tropical rainforest, understory, a variety of animal names.

### MATERIALS:

- "Who's Who" worksheets
- pencils
- encyclopedias
- African wildlife references.

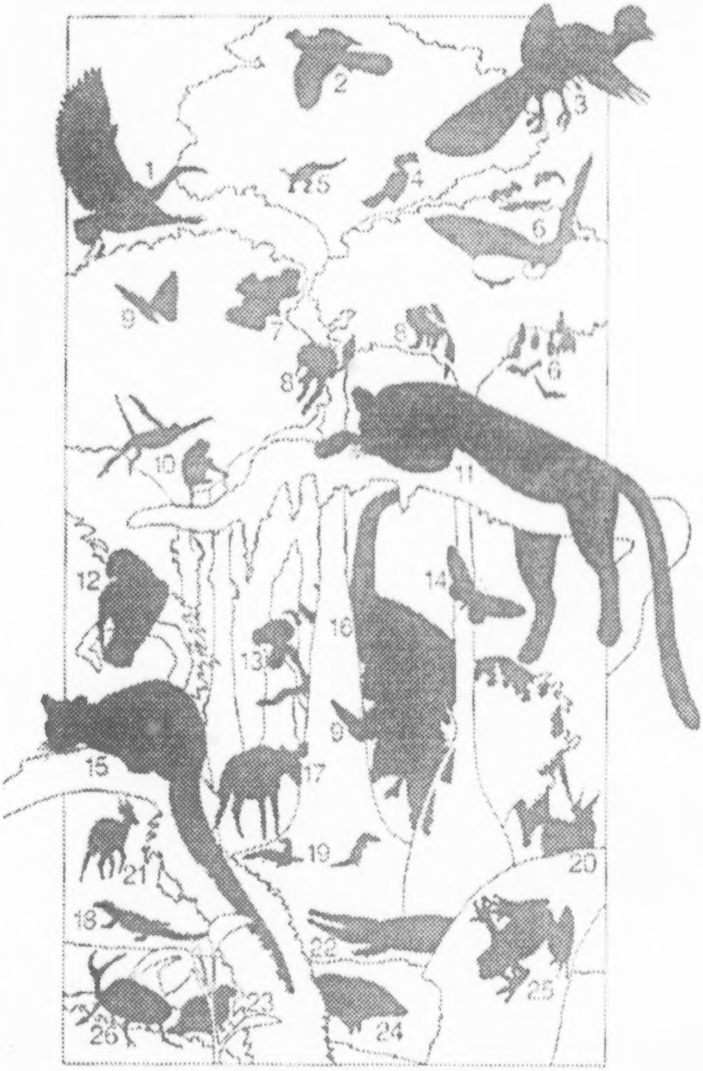
### ACTIVITY DIRECTIONS:

1. Introduce and/or review vocabulary above.
2. Hand out "Who's Who" worksheets to the class.
3. The sheet's illustration depicts 26 African tropical rainforest animals, shown in silhouette, numbered, and positioned in the layer of rainforest that each lives in. The animals' names are listed to the right, mixed up and not numbered.
4. Students are to use references as needed to match animal name to number, and write the matching silhouette number next to the animal's name.

### ENRICHMENT:

- Have students research these animals and report on their niche, diet, reproductive habits - a general species account on each.
- Then have students share the information as short oral reports.

# WHO'S WHO" WORKSHEET


2
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6
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6
10
11
12
14
16
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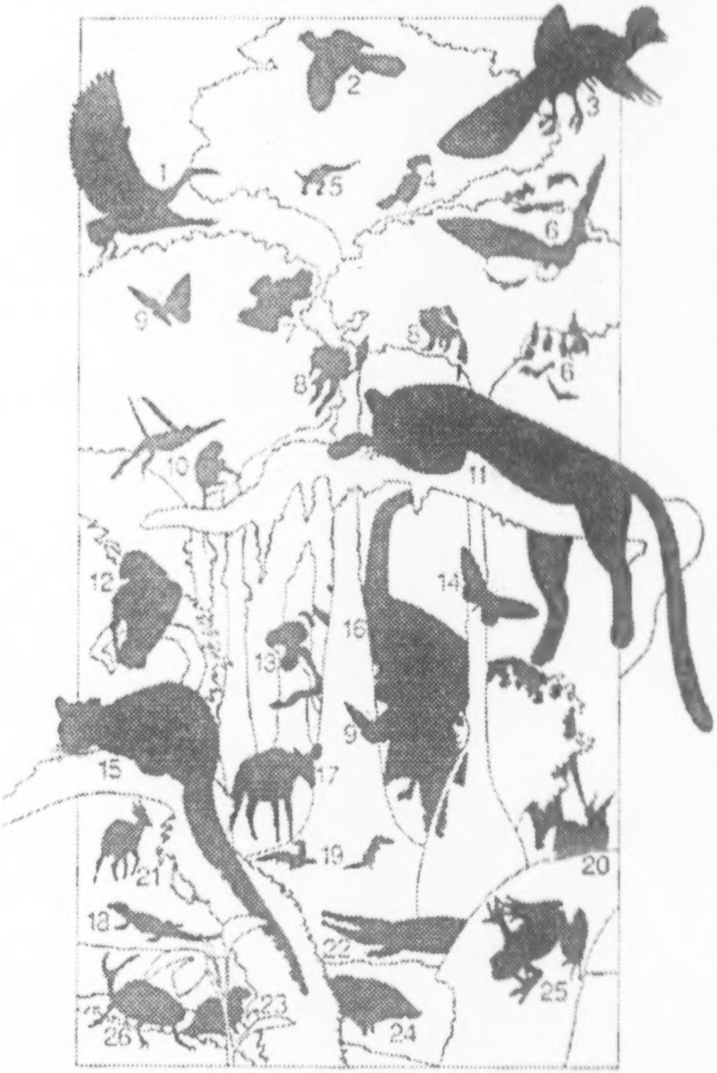
21
19
20
18
22
25
26
23
24

**# ANIMAL**

__ African Giant Swallowtail
__ African Grey Parrot
__ Black And White Colobus Monkey
__ Bongo
__ Cape Clawless Otter
__ Crocodile
__ Crowned Eagle
__ Elephant
__ Fruit Bat
__ Great Blue Touraco
__ Hadada Ibis
__ Hartlaub's Touraco
__ Hornbill
__ Leopard
__ L'Hoest's Monkey
__ Megalorhino Beetle
__ Mocker Swallowtail
__ Mongoose
__ Nile Monitor
__ Okapi
__ Red Colobus Monkey
__ Red River Hog
__ Reed Frog
__ Rock Python
__ Sitatunga
__ Small Spotted Genet

## "WHO'S WHO" WORKSHEET

### Answer Key



| # | ANIMAL |
|---|---|
| 14 | African Giant Swallowtail |
| 12 | African Grey Parrot |
| 8 | Black And White Colobus Monkey |
| 21 | Bongo |
| 23 | Cape Clawless Otter |
| 22 | Crocodile |
| 7 | Crowned Eagle |
| 16 | Elephant |
| 6 | Fruit Bat |
| 3 | Great Blue Touraco |
| 1 | Hadada Ibis |
| 2 | Hartlaub's Touraco |
| 4 | Hornbill |
| 11 | Leopard |
| 10 | L'Hoest's Monkey |
| 26 | Megalorhino Beetle |
| 9 | Mocker Swallowtail |
| 19 | Mongoose |
| 18 | Nile Monitor |
| 17 | Okapi |
| 5 | Red Colobus Monkey |
| 24 | Red River Hog |
| 25 | Reed Frog |
| 13 | Rock Python |
| 20 | Sitatunga |
| 15 | Small Spotted Genet |

# SOFLI, SOFLI CATCH A MONGKI

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to analyze proverbs and understand their meaning.

Social Studies CCG's: 5.1, 5.2, 5.6, 5.7, 6.1, 6.4, 7.3, 7.4, 8.1.

### VOCABULARY:

- proverb
- moral of a story

### MATERIALS:

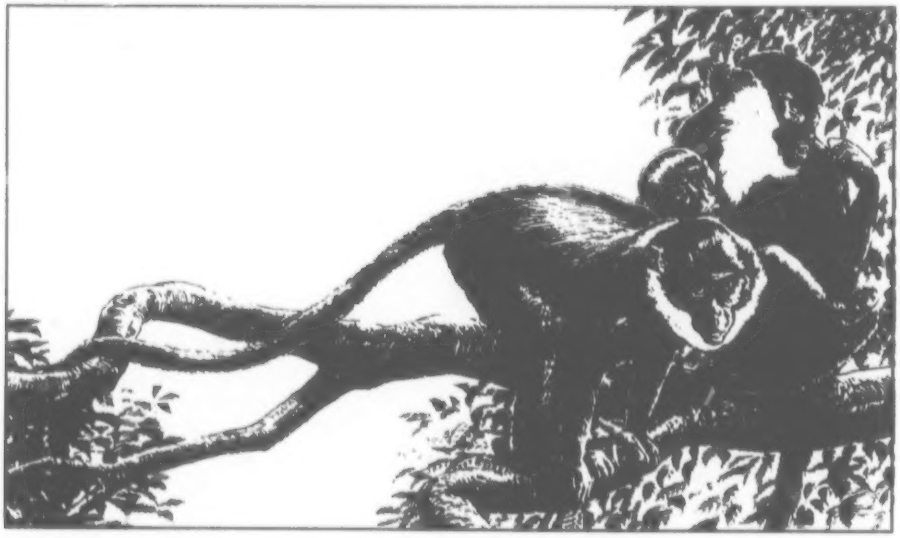
- Copies of the student directions for Sofli, Sofli Catch a Mongki, page 92 & 93

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have individuals or groups discuss the meanings of common proverbs.
- Have students discuss the African proverbs.
- Have students think of other proverbs.
- At the Zoo - Students should write the meaning of Sofli, Sofli Catch a Mongki. Locate other proverbs in the Kongo Ranger Station on the boxes.

### ENRICHMENT:

- Talk to parents and friends to try to learn more proverbs and their meanings. Share the proverbs with classmates.
- Research the origin of the proverb.



# SOFLI, SOFLI CATCH A MONGKI

## Proverbs

Proverbs are short sayings that express a well-known truth, that teaches wisdom or moral lessons. By understanding the meanings and origin of proverbs, you can learn more about the culture of a country.

**With a friend or a group, discuss the following proverbs used in our country. Try to think up the meaning of the proverb and write it in the space provided.**

One good turn deserves another. (Aesop)

Little by little does the trick.(Aesop)

Haste makes waste.

Little friends may prove great friends.(Aesop)

A watched pot never boils.

People who tell lies find it hard to be believed, even when they tell the truth. (Aesop)

You can be a big fish in a small pond or a small fish in a big pond.

**African people also have proverbs. Discuss these proverbs from the Ewe people of Ghana in West Africa and from the people of Cameroon. Try to think of their meanings and write it in the space provided.**

You do not become a chief simply by sitting on a big stool.

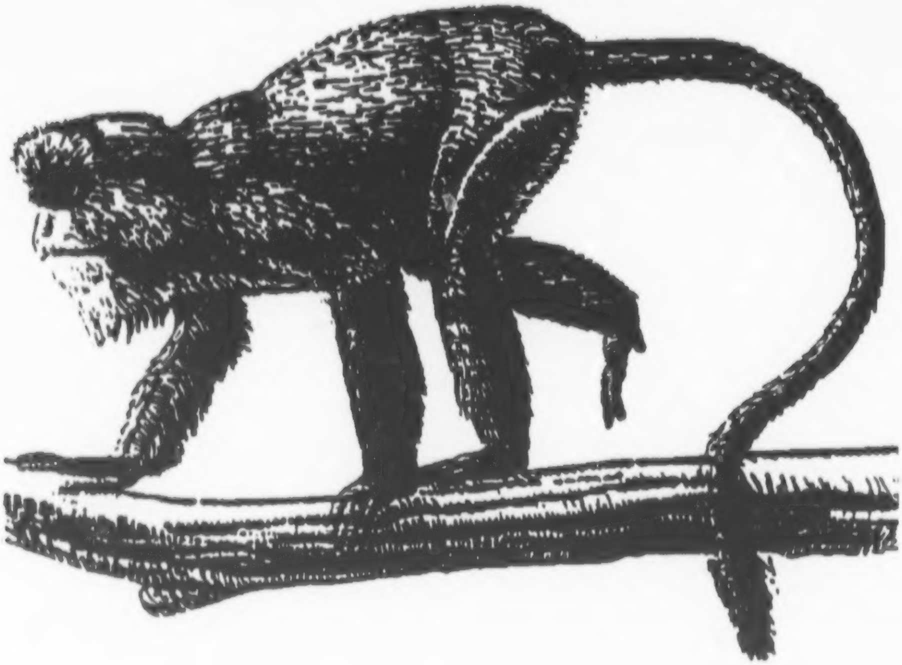
If a white man wants to give you a hat, look at the one he is wearing before you accept it.

Don't insult the crocodile until you cross the river.

Eat the big fish first, the little ones later.

# SOFLI, SOFLI CATCH A MONGKI

## At the Zoo



While looking at the Africa Exhibit, find the proverb Sofli, Sofli Catch a Mongki. Write its meaning below: ______________________________

______________________________

______________________________

What other proverbs can you find listed at the Kongo Ranger Station? Write them and their meanings below: ______________________________

______________________________

______________________________

______________________________

Try to think up other proverbs and their meanings.

______________________________

______________________________

# SOFLI, SOFLI CATCH A MONGKI

## Answer Key

**With a friend or a group, discuss the following proverbs used in our country. Try to think up the meaning of the proverb and write it in the space below.**

One good turn deserves another. (Aesop)
*If someone helps you, help them back.*

Little by little does the trick.(Aesop)
*Little accomplishments can help get a big job done.*

Haste makes waste.
*Take your time when doing a task.*

Little friends may prove great friends.(Aesop)
*Don't under estimate the value of any friend.*

A watched pot never boils.
*Be patient and let things happen.*

People who tell lies find it hard to be believed, even when they tell the truth.(Aesop)
*Tell the truth always, and you will be believed.*

You can be a big fish in a small pond or a small fish in a big pond.
*When you go to a new place, you must learn about the customs and ways, and understand that you may have to take a lower position or rank.*

**African people also have proverbs. Discuss these proverbs from the Ewe people of Ghana in West Africa. Try to think of their meanings and write it in the space provided.**

You do not become a chief simply by sitting on a big stool.
*You must earn the respect of the people to be a great leader.*

If a white man wants to give you a hat, look at the one he is wearing before you accept it.
*If people want to give you something , be sure to know why they are giving it to you.*

Don't insult the crocodile until you cross the river.
*If you make others mad you will not make it through life easily.*

Eat the big fish first, the little ones later.
*Enjoy the best that you have but save for future needs.*

SOFLI, SOFLI CATCH A MONGKI.
SIT DOWN AND ENJOY LIFE.

# FOLK ART OF AFRICA

## Teacher Information

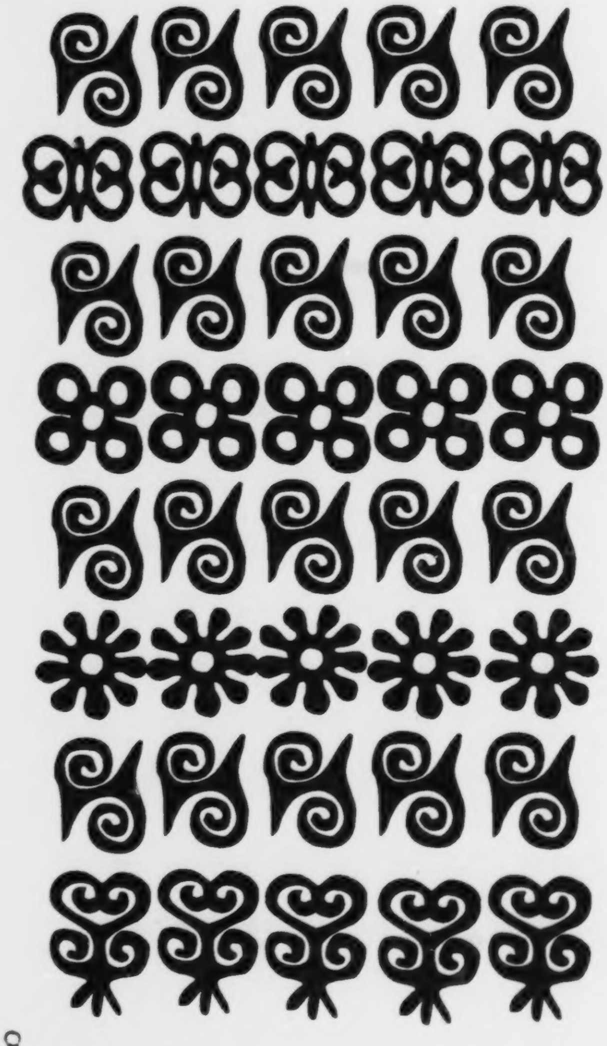
### ACTIVITY OBJECTIVE:

Students will become familiar with some of the folk art of Africa and apply similar techniques to create designs on paper or in cloth.

Social Studies CCG's: 5.1, 5.2, 5.6, 6.1, 6.4, 7.3, 7.4, 8.1.

### MATERIALS:

- white cotton cloth
- blue or black fabric dye
- wheat paste or glue (or wax)
- table knives
- copies of African folk art designs

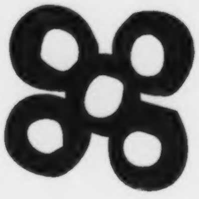


### ACTIVITY DIRECTIONS:

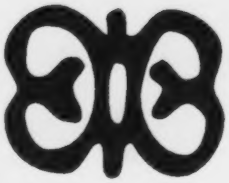
- Have students study folk art designs of Africa such as Adinkra Designs from Ghana.
- Students paint designs on the white cloth with the wheat paste (or melted wax ).
- Color the fabric in the blue or black dye.
- Remove the paste by chipping it with table knives (or iron the wax out of the cloth through multiple layers of newspaper).

### ALTERNATIVE DIRECTIONS:

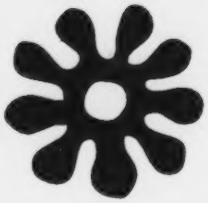
- Make the designs with paper and white crayon.
- Wash the paper with blue or black water colors.
- Use designs to make banners, borders, decorations, etc.



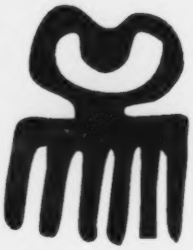
**MPUANNUM**
Five tufts of hair, a traditional hairstyle



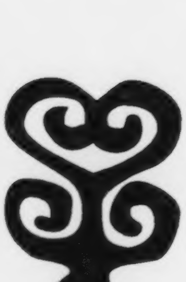
**BIRIBI WO SORO**
A symbol of hope, meaning "There is something in heaven"



**SE DIE FOFOO PE, NE SE GYINANTWI ABO BEDIE**
A well - known Asanti saying: "What the fofoo plant wants is that the gyinantwi seeds should turn black." A symbol of jealousy



**DUAFE**
A wooden comb



**SANKOFA**
A symbol meaning that you can always undo your mistakes

# GET A LIFE!

◆

# GRADES 3-5

Get a Life! helps students understand how animals live in and adapt to their environment. This section includes information about the natural resources that are found in Africa. Students begin to understand the inter-relationship of Africa and America by analyzing their use of products from Africa.

Select the appropriate activities for use in your class from the descriptions below:

## HERBIVORE, CARNIVORE, OR OMNIVORE?*

- Students classify the animals of the African savannah or rainforest as an herbivore, carnivore or omnivore and tell what kind of food they eat.

## FOOD WEB-A TANGLED MESS*

- Students learn about the interrelationships of the animals and plants of the African savannah and rainforest by studying food webs.

## BRIGHT BLUE BALL*

- Students study animals and learn about symbiosis, parasitism, commensalism and mutualism and understand that symbioses are relationships of interdependence.

## SAVANNAH HUNT*

- Students classify animals according to their role in a food chain, and according to their classes: mammals, birds, reptiles, amphibians and fish.

## RAIN FOREST HUNT*

- Students classify animals according to their role in a food chain, and according to their classes: mammals, birds, reptiles, amphibians and fish.

## RAINFOREST PRODUCTS

- Students learn about products from the rainforest.

*Other activities can be adapted from those starred activities that are included in the 6th-8th Grade Level.

# HERBIVORE, CARNIVORE OR OMNIVORE?

## Teacher Information

### ACTIVITY OBJECTIVES:

- To familiarize students with animals and plants of the African savannah and rainforest.
- To become familiar with the differences between an herbivore, carnivore and omnivore.
- To identify and classify animals of the African savannah and rainforest as herbivore, carnivore or omnivore.

Concepts: 1.1 - 1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### VOCABULARY:

- carnivore
- consumer
- herbivore
- omnivore
- predator
- prey
- producer

### MATERIALS:

- dictionaries
- encyclopedias
- or other science reference materials such as texts

### TEACHING SUGGETIONS:

- This activity can be used as a pre-visit exercise to the zoo. It will also serve those that are unable to plan an on-site visit.
- Please refer to the list of plants and animals at the end of this packet to have a list of the animals that can be classified as herbivore, carnivore and omnivore. You may want to select animals or have students select animals themselves.
- Once you have some animals selected, have students research their animal(s) to find out what kind of food they eat and which category that animal fits into.
- When defining the vocabulary words to the left, there are several ways that may make defining interesting. This could be a brainstorming activity where the class is involved in pulling on the information they may already have.
- You could also have chosen students look the words up and read the definitions to the class or have all students define the words using what resources you have available. Breaking the words down into their roots is an interesting way to visualize them:

| | |
|---|---|
| herb- | Latin, meaning 'plant' |
| carn- | Latin, meaning 'flesh' or 'meat' |
| omni- | Latin, meaning 'all' |
| vore- | Latin, derived from *vorus* or *vorare*, meaning 'to devour' |

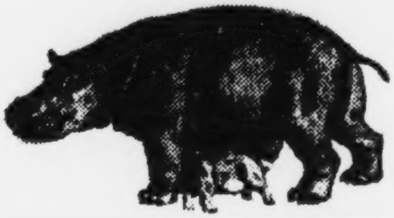
# HERBIVORE, CARNIVORE OR OMNIVORE?

## ACTIVITY DIRECTIONS:

- Define the vocabulary words using the directions that your teacher has given you.
- Using encyclopedias or other resources, research an animal(s) of the African savannah and/or rainforest. The list of animals may be found at the beginning of the Africa Overview in this packet.
- Classify the animals of the African savannah or rainforest as an herbivore, carnivore or omnivore and tell what kind of food they eat. Also tell if this animal is a predator or prey.
- Think about some native local animals and classify them as herbivore, carnivore, omnivore, predator and/or prey.

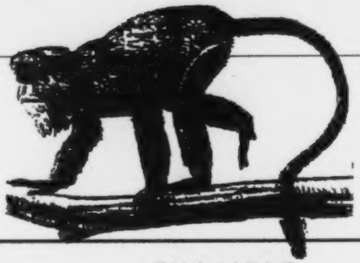
## AT THE ZOO

Use the following charts to become familiar with the animals in the Africa and Cascades exhibits and classify them as herbivore, carnivore, omnivore, predator and/or prey.



## THE SAVANNAH

| FOOD GROUP | EXAMPLE |
|---|---|
| PRODUCER | |
| HERBIVORE | |
| OMNIVORE | |
| CARNIVORE | |



## THE RAIN FOREST

| FOOD GROUP | EXAMPLE |
|---|---|
| PRODUCER | |
| HERBIVORE | |
| OMNIVORE | |
| CARNIVORE | |

## THE CASCADES

| FOOD GROUP | EXAMPLE |
|---|---|
| PRODUCER | |
| HERBIVORE | |
| OMNIVORE | |
| CARNIVORE | |

# FOOD WEBS—A TANGLED MESS!

## Teacher Information

### ACTIVITY OBJECTIVES:

- To familiarize students with the interrelationships of the animals and plants of the African savannah and rainforest.
- To promote an understanding of interrelationships and dependency between plants and animals in a given ecosystem.
- To illustrate the concept of a food web.

Concepts: 1.1 - 1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### VOCABULARY:

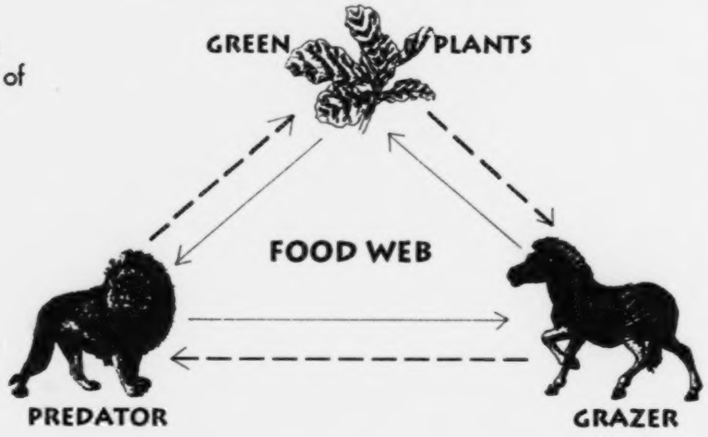
- carnivore
- consumer
- food chain
- food pyramid
- food web
- herbivore
- omnivore
- predator
- prey
- producer

### MATERIALS:

- reference materials to help define words and to discuss the concept of food webs.
- one to two balls of string or yarn

### TEACHING SUGGESTIONS:

- This activity can be used as a pre- or post- visit exercise to the zoo. It can also serve those that are unable to plan an on-site visit.
- Prepare students for this activity by defining the vocabulary words to the left. The suggestions for defining are in the Teaching Suggestions section of the activity entitled 'Herbivore, Carnivore or Omnivore' in this packet.
- When students have become familiar with the vocabulary you may want to discuss how a food web works and maybe even discuss what 'interrelationships and dependency' are.
- When you feel students have a grasp of what a food chain is, try the following activity to help to visualize a food web. You may want a cleared classroom or to go outside.
- Please note that if you are doing this activity for the rainforest ecosystem, the connections may not occur as easily as they will for the savannah ecosystem due to the specialization and diversity of rainforest. There are many small food chains that can be formed but large connections may not be as apparent. Forming food chains may be more appropriate.



# FOOD WEBS—A TANGLED MESS!

## ACTIVITY DIRECTIONS:

This activity will help you to understand what a food web is and to see that all the animals and plants in an area, or ecosystem, all depend upon on another to live.

- Define the vocabulary words above using the directions that your teacher has given you.

- Discuss as a class or with a partner what you think a food web is. You may want to think of a spider web when you are discussing this.

- With your teacher's help, choose an animal or plant of the African savannah or rainforest. Research or discuss your plant or animal and find out what kind of food it needs to survive. What are the sources of food energy for this organism?

- Your teacher will provide your class with a ball of string or yarn. With all of the class standing up, your teacher will give the ball of string to one student. That student, who has a chosen animal that they have researched or discussed, will now pass the ball to a student who has researched an organism who is either a food energy source or who consumes their chosen animal. The next student will now pass the ball to a student that has an organism that is related to theirs. With each pass, each student shall hold a piece of the string or yarn before passing to the next student. In this way, you will form a web that will entangle the entire class.

## ENRICHMENT:

If you want to play this like the game 'Silent Ball', you can make name tags or signs to hang around your neck with string that either has the name of your animal or plant or has a picture that you have drawn or cut out of a magazine. Pass the ball of string like is directed above but no one can say anything. If someone talks, they are out of the game and have now put a break in the foodweb. If this happens, you may want to discuss what happens in the real world when a certain animal or plant drops out of the food web and what are the circumstances that would cause that to happen.

# BRIGHT BLUE BALL

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- define symbiosis, parasitism, commensalism and mutualism
- classify relationships as non-symbiotic or symbiotic, and if so, which kind
- understand that symbioses are relationships of interdependence

Concepts: 1.1 - 1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### VOCABULARY:

- commensalism
- interdependence
- mutualism
- parasitism
- symbiosis

### MATERIALS:

- inflatable "earth" ball
- drawing or painting supplies
- encyclopedias
- illustrated African wildlife references

### ACTIVITY DIRECTIONS:

- Introduce and/or review vocabulary with your students. Display these words and their meanings in the classroom prominently.
- Print the attached list of symbiotically paired organisms on butcher paper and display this, too. Have pairs of students adopt a symbiotic pair to research.
- Each student pair will produce a brief written description of the symbiotic relationship, identifying which type of symbiosis exists, and "who derives what benefits or harm from whom." Have students include drawings of each organism.
- Have students present their material in short oral reports. Display their work around the room for reference.
- Now form a circle with students kneeling 3 feet apart from one another. Begin the game by saying the name of one of the symbiotically related organisms your students researched. Immediately lob the "earth" to a student across the circle. Whoever catches it must name the organism that is symbiotically related to the one you named. If the "earth" is caught and the organism correctly named, this counts as one connection. The receiver then names a new organism and throws the earth to someone else, who must name its partner and catch the earth.
- The object is to make as many consecutive connections as are possible. A dropped earth or missed organism starts the count over. Emphasize that students must encourage one another positively to do a group best. You may wish to develop rules regarding taking turns to ensure better participation.

### ENRICHMENT:

- Have students research African animals at the Zoo in search of symbioses. Publish a class-compiled, illustrated book of symbioses of African wildlife.
- Have students create one-act plays dramatizing the nature of the symbiosis of a pair of African organisms. Make sets, costumes; personify, use music, humor—be creative while effectively communicating a symbiotic relationship. Perform for one another, younger students, or cut a video.
- Adapt the game to increase complexity:

a. thrower names organism, receiver names its partner, identifies type of symbiosis, explains why.
b. thrower names symbiosis, receiver gives exemplary pair of organisms, explains why.

c. thrower names a benefit derived symbiotically (food, shelter, pollination, reproductive assistance, defense, disease or pest control) and receiver names exemplary pair of organisms and type of symbiosis.
d. thrower reads brief account of new symbiotic pair, receiver must identify which kind of symbiosis and explain why.
e. apply this game to food chains, food webs and other ecological relationships.

## BACKGROUND:

Symbiosis is a relationship of dependence or interdependence between two organisms. Types of symbiosis include parasitism, commensalism and mutualism.

In a parasitic relationship, one organism derives benefit from and harms another. The victim is termed "host" and the victimizer "parasite." Fleas and dogs have a parasitic relationship - fleas obtain food (blood) from dogs and can infect them with disease or other parasites.

In a commensal relationship one organism derives benefit from another without helping or harming it. The banded mongoose often finds shelter in the chimney of an African termite mound, which has no effect on the colony below.

Mutualism describes two organisms deriving benefit from one another. The Egyptian Plover (a bird) grooms the gums and mouth area of the crocodile. The bird obtains food while ridding the crocodile of parasites. Typical benefits of symbiosis are food, shelter, pollination, seed dispersal, defense, disease and pest control.

# BRIGHT BLUE BALL

## African Symbiotic Pairs

1. honey guide bird and honey badger (mutualism).

This bird finds the badger and leads it to a beehive. The badger destroys the hive and feeds on the honey. The bird eats the remaining honey and the wax.

2. Egyptian plover and crocodile (mutualism).

This bird rids the crocodile of ectoparasites by grooming its mouth area, thereby obtaining food for itself. The bird also alerts the crocodile to danger.

3. mosquitoes and humans (parasitism).

Adult female mosquitoes suck blood from humans and other vertebrates for nourishment to form and lay healthy eggs. The host may also be infected with a variety of disease-causing organisms.

4. banded mongoose and termites (commensalism).

Africa mound termites build tall, hollow chimneys to ventilate their colonies. Banded mongoose will live in these hard shelters and the termites neither benefit nor suffer for it.

5. termites and fungus (mutualism).

African mound termites cultivate a fungus in their colonies, which they eat with cellulose from plants. They need the fungus to digest the cellulose. They also bring it above ground briefly in the rainy season so that it may reproduce and complete its life cycle. It could not survive without the termites.

6. termites and protozoans (mutualism).

Tiny protozoans live in the digestive system of termites. They can break down cellulose from plant fiber, releasing its energy for use by the termite. The termite provides shelter and food, while the protozoans render the food usable to the termite.

7. tsetse fly and cattle (parasitism).

This blood-sucking fly transmits trypanosomes (parasitic protozoans) into the wounds it creates. Host cattle are then infected with a parasitic disease such as sleeping sickness. Tsetses infect humans, too.

8. mimosa girdler (beetle) and mimosa tree (mutualism).

The beetle makes a slit in a mimosa branch, and lays eggs in it. Mimosa sap would kill the eggs, so the beetle girdles the branch on both sides of the eggs. The eggs later hatch, and the branch dies beyond the nest, eventually breaking off. This seeming parasitism actually has the effect of pruning, which can double a mimosa's life.

9. impala and acacia tree (mutualism).

The impala browses on acacias, but acacia seeds are hard, often passing through the impala undigested. While the impala obtains food, the acacia accomplishes seed dispersal, free from the shade of the parent tree, and fertilized.

10. rhinoceros and oxpecker (mutualism).

The oxpecker is a bird that rides the rhino's back, eating parasitic insects on its back. This rids the rhino of pests and yields food and a safe haven for the bird. Oxpeckers quickly alert rhinos to perceived danger.

11. ant - gall acacia and ants (mutualism).

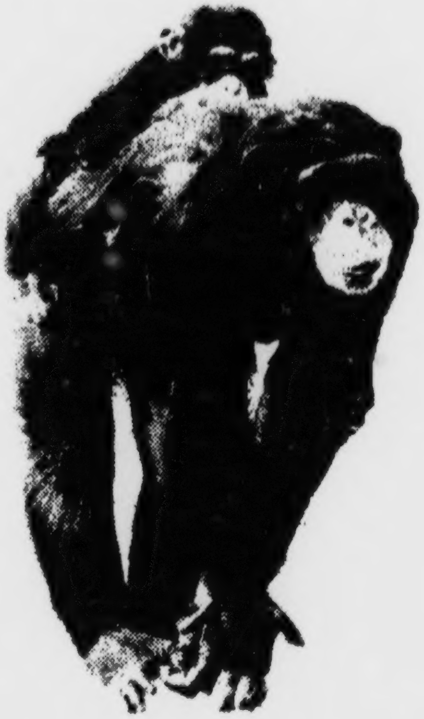
Galls are abnormal, swollen growths on tree branches, caused by injury, insects or microorganisms. On the ant-gall acacia, ants hollow homes in the numerous galls, and will quickly attack any browsers attempting to make a meal of the acacia.

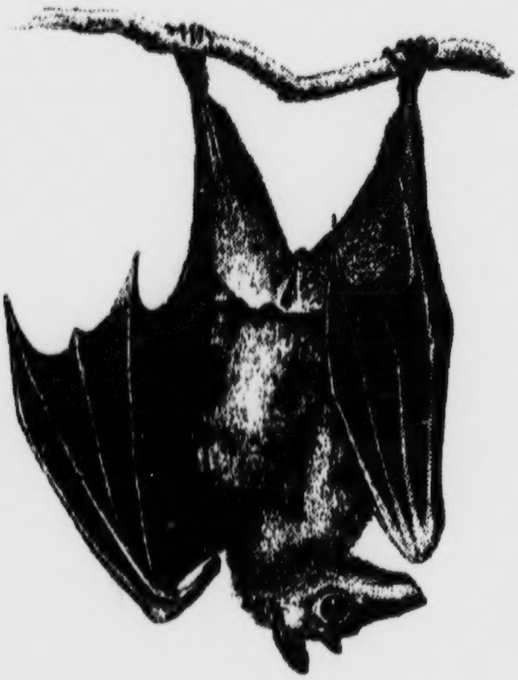
12. leech and crocodile (parasitism).

Leeches live in water and attach to a crocodile's body with suction-cup mouths. They then break the skin and drink the host's blood. This also increases the risk of disease for the crocodile.

13. fig trees and monkeys (mutualism).

This is a seed dispersal for food trade. Monkeys distribute fig pits while eating and in feces, obtaining food and enhancing the fig population.





14. fruit bats and fig trees (mutualism).

Fruit bats widely disperse undigested seeds of fruit in their feces, constantly replanting their own food sources.

15. pollen-eating bat and night-blooming flowers (mutualism).

Pollen-eating bats in West African tropical rainforests pollinate flowers from which they gather food, thereby helping to ensure their own future food supply.

16. cattle egret and African Ankole (cow) (commensalism).

Cattle movement causes many insects to stir from the ground, and egrets feed on them, neither helping nor harming the cattle. Without cattle, these birds must work harder for less food.

# SAVANNAH HUNT

## Teacher Information

### ACTIVITY OBJECTIVES:

1. To classify animals according to their role in a food chain.
2. To classify animals according to their classes: mammals, birds, reptiles, amphibians and fish.

Concepts: 1.1 - 1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### VOCABULARY:

- amphibian
- carnivore
- herbivore
- mammal
- omnivore
- predator
- prey
- reptile
- scavenger

### MATERIALS:

- writing tools
- 'Savannah Hunt' chart

### TEACHING SUGGESTIONS:

- This activity is to be used as an on-site exercise while visiting the zoo.
- It is designed to have students use their knowledge of animal classes and food sources.
- It is suggested that students pay close attention to the information signs at each animal exhibit to complete the following charts.
- You will need to go over the vocabulary before visiting the zoo and attempting this activity. There are suggested ways to define vocabulary words in the activity 'Herbivore, Carnivore or Omnivore?'

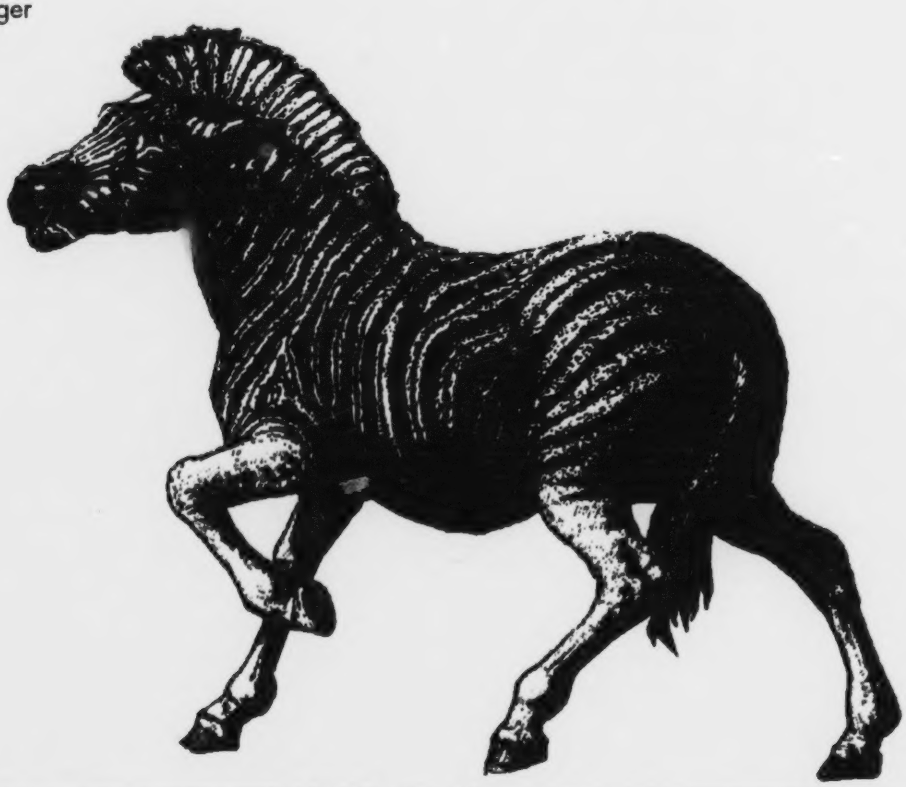
# SAVANNAH HUNT

## ACTIVITY DIRECTIONS:

- Before visiting the zoo, define the vocabulary below using the directions that your teacher has given you.
- When you get to the zoo, go to the African savannah exhibit and fill in the chart.
- To complete each chart, go through the savannah exhibit and identify animals that are mammals, birds, reptiles, amphibians, and fish. Write down the name of animals that fit into that category. For each of those animals, put a check in the box if they are a carnivore, herbivore, omnivore, predator, prey, and/or scavenger.

## VOCABULARY:

- amphibian
- carnivore
- herbivore
- mammal
- omnivore
- predator
- prey
- reptile
- scavenger



## SAVANNAH HUNT

| MAMMALS | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| BIRDS | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| REPTILES | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| AMPHIBIANS AND FISH | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

# RAINFOREST HUNT

## Teacher Information

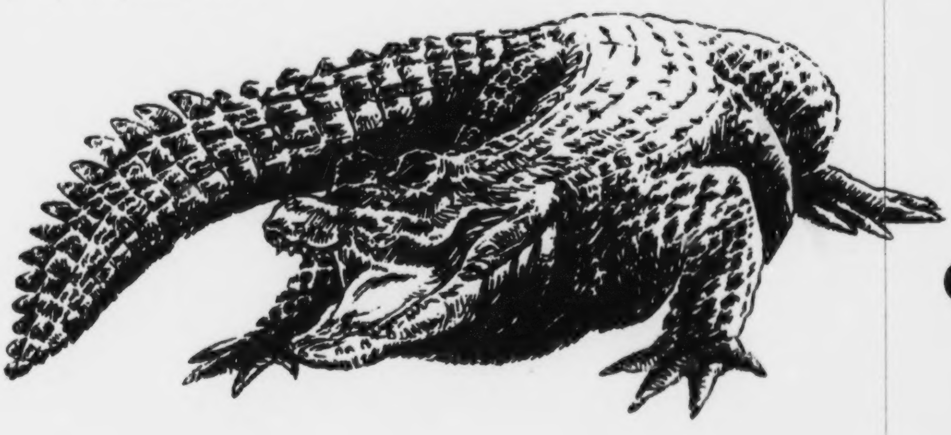
### ACTIVITY OBJECTIVES:

- To classify animals according to their role in a food chain.
- To classify animals according to their classes: mammals, birds, reptiles, amphibians, and fish.

Concepts: 1.1 - 1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### VOCABULARY:

- amphibian
- carnivore
- herbivore
- mammal
- omnivore
- predator
- prey
- reptile
- scavenger



### MATERIALS:

- writing tools
- 'Rainforest Hunt' chart

### TEACHING SUGGESTIONS:

- This activity is to be used as an on-site exercise while visiting the zoo.
- It is designed to have students use their knowledge of animal classes and food sources.
- It is suggested that students pay close attention to the information signs at each animal exhibit to complete the following charts.
- You will need to go over the vocabulary before visiting the zoo and attempting this activity. There are suggested ways to define vocabulary words in the activity 'Herbivore, Carnivore or Omnivore?'

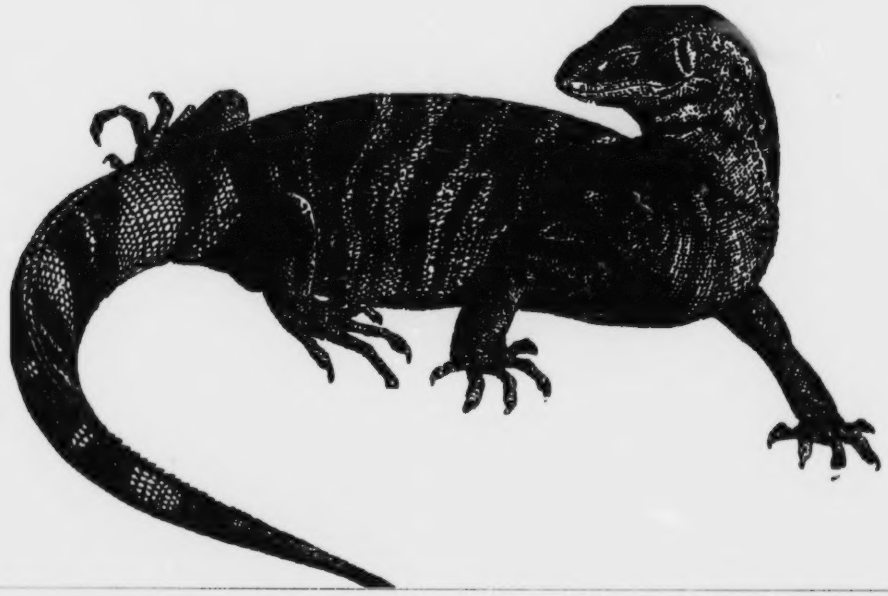
# RAINFOREST HUNT

## VOCABULARY:

- amphibian
- carnivore
- herbivore
- mammal
- omnivore
- predator
- prey
- reptile
- scavenger

## ACTIVITY DIRECTIONS:

- Before visiting the zoo, define the vocabulary above using the directions that your teacher has given you.
- When you get to the zoo, go to the African rainforest exhibit and fill in the chart that is entitled 'Rainforest Hunt'.
- To complete each chart, go through the rainforest exhibit and identify animals that are mammals, birds, reptiles, amphibians, and fish. Write down the name of animals that fit into that category. For each of those animals, put a check in the box if they are a carnivore, herbivore, omnivore, predator, prey, and/or scavenger.



## RAINFOREST HUNT

| MAMMALS | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| BIRDS | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| REPTILES | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

| AMPHIBIANS AND FISH | Carnivore | Herbivore | Omnivore | Predator | Prey | Scavenger |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |

# RAINFOREST PRODUCTS

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify products of African rainforest.

Social Studies CCG's: 1.1, 1.2, 1.4, 1.6, 3.3, 3.4, 6.1, 7.3, 7.4, 8.1.

### MATERIALS:

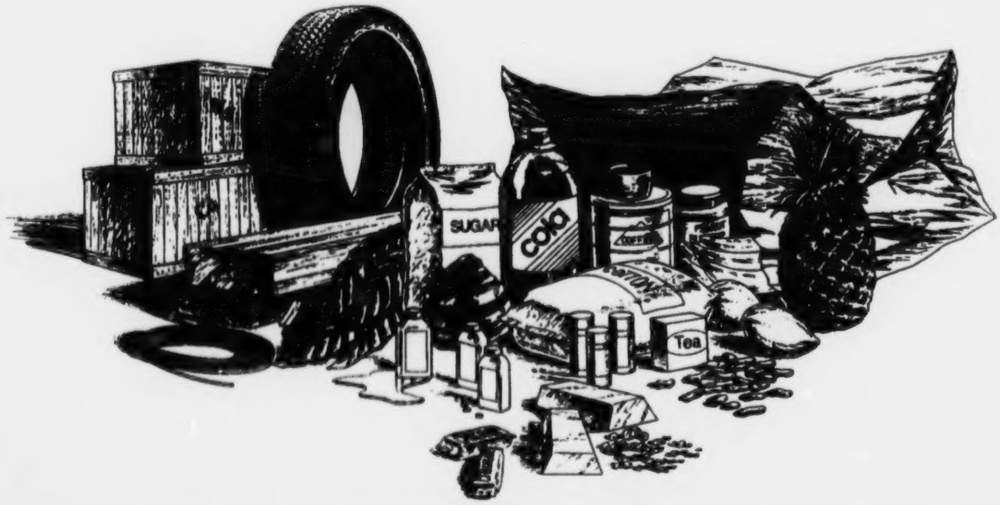
- Copies of the student directions for Rainforest Products Word Search.

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have students complete the African Rainforest Products Word Search.
- Have students think of other products and their uses.
- Have individuals or groups share their answers.

### ENRICHMENT:

- What are the environmental issues related to the harvest/use of these products?
- Create a menu of rainforest foods.
- Write directions for making a dessert using products from the rainforest such as cocoa, coconut, bananas, etc.
- Have students write math problems related to the cost of products from the rainforest. Share the problems, and have friends try to solve them.



# RAINFOREST PRODUCTS

## Word Search

Find these products from the Africa Rainforest and locate two bonus words in the puzzle below.

- cocoa
- bananas
- palm oil
- coffee
- sweet potatoes
- wood
- rubber
- rope
- tropical fruit
- cotton
- gold
- copper
- spices
- tea
- diamonds

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | C | T | V | R | Y | I | S | K | C | U | L | P | G | A |
| F | P | E | R | E | B | F | C | M | O | S | A | D | H | E |
| R | T | R | O | P | I | C | A | L | F | R | U | I | T | L |
| I | A | E | P | O | S | A | L | E | F | U | G | A | F | D |
| C | O | T | A | E | L | D | C | Z | E | B | K | M | I | A |
| A | M | B | C | O | P | P | E | R | E | B | G | O | L | D |
| R | A | I | N | F | O | R | E | S | T | E | O | N | P | E |
| X | P | F | O | C | S | C | F | B | H | R | L | D | A | M |
| S | W | E | E | T | P | O | T | A | T | O | E | S | C | B |
| C | O | P | D | U | E | T | E | N | D | B | J | M | K | F |
| A | O | V | E | Q | N | T | P | A | L | M | O | I | L | O |
| R | D | C | L | A | G | O | H | N | C | Z | X | W | E | P |
| E | T | R | O | B | A | N | A | A | M | R | T | S | O | L |
| F | U | S | W | A | C | B | M | S | P | G | I | H | Y | R |

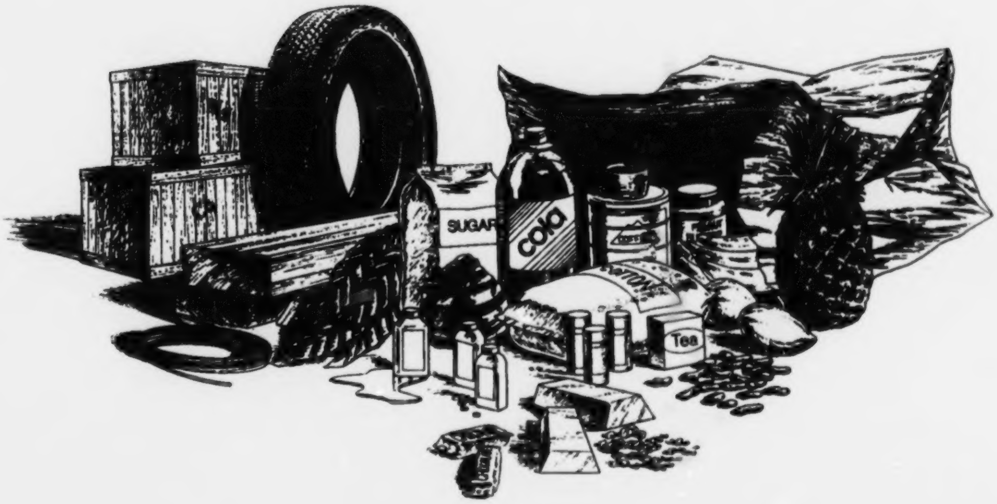
SUGAR
cola
Tea

# RAINFOREST PRODUCTS

## Word Search

The bonus words are: AFRICA and RAINFOREST

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | C | T | V | R | Y | I | S | K | C | U | L | P | G | A |
| F | P | E | R | E | B | F | C | M | O | S | A | D | H | E |
| R | T | R | O | P | I | C | A | L | F | R | U | I | T | L |
| I | A | E | P | O | S | A | L | E | F | U | G | A | F | D |
| C | O | T | A | E | L | D | C | Z | E | B | K | M | I | A |
| A | M | B | C | O | P | P | E | R | E | B | G | O | L | D |
| R | A | I | N | F | O | R | E | S | T | E | O | N | P | E |
| X | P | F | O | C | S | C | F | B | H | R | L | D | A | M |
| S | W | E | E | T | P | O | T | A | T | O | E | S | C | B |
| C | O | P | D | U | E | T | E | N | D | B | J | M | K | F |
| A | O | V | E | Q | N | T | P | A | L | M | O | I | L | O |
| R | D | C | L | A | G | O | H | N | C | Z | X | W | E | P |
| E | T | R | O | B | A | N | A | A | M | R | T | S | O | L |
| F | U | S | W | A | C | B | M | S | P | G | I | H | Y | R |



# CARING NOW FOR THE FUTURE OF LIFE

◆

## GRADES 3-5

CARING NOW FOR THE FUTURE OF LIFE is designed to show students that they can shape the future by their actions today. Through these activities, students will gain an increased awareness of environmental issues related to the air, land, and water. It is our hope that students will learn to become better caretakers of the earth.

A variety of activites are included to help students better understand their role in caring for the future of life on the planet Earth. Activities may be selected for use from the following descriptions:

### ENDANGERED ANIMALS

- Students write a persuasive piece to save an endangered animal from either the savannah or rainforests.

### AFRICA WRITING ACTIVITIES

- Students write in several modes about issues related to African rainforest and savannah.

### GLOBAL WARMING IN A JAR*

Students gather, format, graph and interpret temperature data in order to gain an understanding of the "greenhouse effect" concept.

### SUSTAINED USE OR ABUSE?

- Students classify products and land-use practices as "sustainable use" or "abuse" with respect to environmental integrity.

### HELP THE EARTH*

- Students analyze things that are harmful to the earth's environment and think of alternative things to use.

Other activities can be adapted from the starred activities in the 6th-8th Grade Level section.

# ENDANGERED ANIMALS

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to write a persuasive piece to save an endangered animal from either the savannah or rainforests of Africa.

Social Studies CCG's: 6.1, 6.2, 7.3, 7.4, 8.1.

### VOCABULARY:

- arid
- endangered species
- ecology
- poaching
- tropical

### MATERIALS:

- copies of the persuasive writing activity.
- pencils/pens

### ACTIVITY DIRECTIONS:

- Review the directions for completing the persuasive writing activity prior to the zoo field-trip.
- Have students work individually to complete the pre-writing activity.
- Have students write a persuasive letter back at school.
- Revise, edit, and create a final copy of the letter.

### ENRICHMENT:

- Have individuals share their letters with their classmates.
- Identify an agency to receive the letter.
- Create posters to save endangered animals.
- Join a support group for endangered species.
- Adopt an animal at the zoo.

# ENDANGERED ANIMALS

Gather information about an endangered animal of the savannah or rainforest in the Africa Exhibit. Include characteristics, number of species left, habitat, place in food chains, reasons for extinction, etc.

**Animal**______________________________

## BACK AT SCHOOL

Write a letter to an agency (organization, country, government) persuading them to help stop the extinction of your animal. Revise and edit your letter. Share it with your classmates and/or send it to the identified agency.

# AFRICA WRITING ACTIVITIES

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will be write in several modes about issues related to African rainforest and savannah.

Social Studies CCG's: 6.1, 6.2, 7.3, 7.4, 8.1.

### MATERIALS:

- Copies of the Africa Writing Activities.
- writing paper
- pencils/pens
- art supplies-construction paper, felt pens, scissors, glue, etc.
- (optional) book binding materials

### ACTIVITY DIRECTIONS:

- Have students select one or more of the writing activities to complete.
- Students should brainstorm ideas, make a rough draft, revise the rough draft, edit the draft, and create a final product.
- have students determine the appropriate method to share their writing:
  read to another student/class, mail a letter or brochure, display on a bulletin board, etc.

**Addresses of Embassies of African Rainforest and Savannah Countries can be found in a related activity-Language Arts and Africa in the 6th-8th Grade Level of this packet. (page 219)**

# AFRICA WRITING ACTIVITIES

## DESIGN A TRAVEL BROCHURE

Study information about an African country of the Rainforest or Savannah Region and design a travel brochure. Arrange your brochure to be interesting and pleasant to look at. Be sure to include drawings and maps, or use pictures from magazines to enhance your brochure. Neatness is very important. Share your final copy with classmates.

## AFRICAN ANIMALS OF THE SAVANNAH OR RAINFOREST

Imagine that you are an animal of the savannah or rainforest. Describe yourself. Include information about who you live with, what you eat, and how you spend your waking hours. Include information that you have learned about your animal.

## WHAT DO YOU THINK OR FEEL ABOUT THE ZOO'S AFRICA EXHIBIT

After touring the Africa Exhibit, think about the things you liked or disliked; the animals and their habitats-were they how you imagined they should be?; what would you change if you could?; which exhibit was your favorite?; was it important to come to the zoo to better understand Africa? Write a letter to the zoo director, stating your thoughts about the exhibit.

## A NEW ZOO EXHIBIT

You have $$$$$ to spend on a new zoo exhibit. Pick an exhibit area of the zoo that you would like to see improved. Design a new exhibit. Describe the exhibit area telling why it would be better for the animals or the people visiting the zoo. Make a picture or diagram of the new exhibit. Send your ideas to the zoo director.

# GLOBAL WARMING IN A JAR

## OBJECTIVES:

Students will demonstrate the ability to...

- read thermometers accurately
- gather, format, graph and interpret temperature data
- infer cause and effect based upon data interpretation
- comprehend the "greenhouse effect" concept

Concepts: 1.1, 1.2, 1.4, 1.7, 1.11-1.14, 1.19, 1.22
Processes: 2.1-2.3, 2.5, 2.11, 2.12, 2.14, 2.15

## VOCABULARY:

- Celsius
- Farenheit
- greenhouse effect
- thermometer.

## MATERIALS:

(for each pair of students) 2 large clear jars, plastic or glass, of at least one quart capacity, with lids on and labels stripped off; 2 thermometers that will fit inside the jars; plastic overhead transparency graph grid sheets; erasable pens; a sunny day; a watch.

## ACTIVITY DIRECTIONS:

1. Create student teams and see that all are equipped.
2. Have students place a thermometer in each jar and close the lid on one of them...the closed jar is "the greenhouse".
3. Explain that students will be recording temperatures from inside the jars every 60 seconds for nearly 30 minutes, and will need a ready format for recording their data. Discuss, and have students model possible data formats, and allow students to choose one and develop it for the lab. Then have students write their predictions.
4. Next spread your teams out on a sunny field or playground with jars exposed to direct sunlight. Students may record their first temperatures immediately, and thereafter every 60 seconds; those without watches can pace with another group.
5. Students should continue recording until temperatures within the jars have peaked and failed to rise for four consecutive minutes.

## BACK IN THE CLASSROOM:

Now give students transparency graph grid sheets. Have them graph both jars' temperatures on a line-point graph, using two different colors to indicate the different jars. These need to be labeled. You can model the process step-by-step on an overhead projector, incrementing and labeling each axis with the class' suggestions. More experienced students may want to choose their own formats, or generate graphs on a computer.

## DISCUSSION:

Question students about the lab. Ask them to explain what happened and why. Invite volunteers to display their graphs on the overhead. Ask them to interpret their data and explain why the graphs are shaped as they are, why they are similar or different. Encourage discussion by comparison of the two curves on each graph. Relate results to student predictions and discuss conclusions. Is it good to have several repetitions of the same experiment?

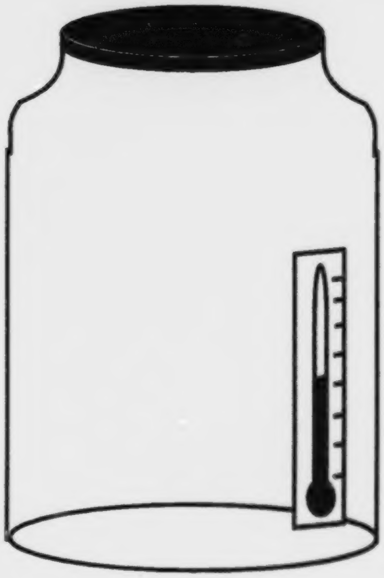
## BACKGROUND:

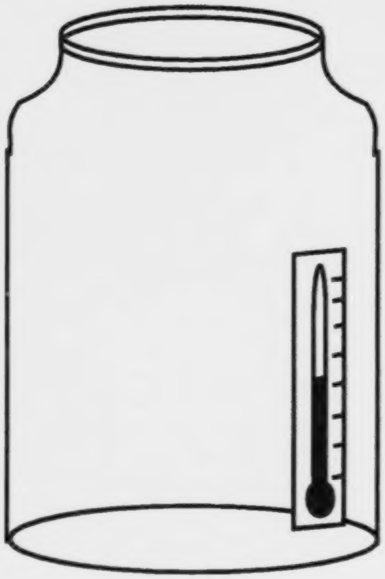
The greenhouse jar (lid closed) should heat up faster, hotter and longer. Some of the energy in sunlight will penetrate the jar, be absorbed by the jar or its air, and take the form of heat energy. The open jar has no lid, so as air heats and expands inside, it becomes less dense and rises above the cooler, more dense air around it, like a hot air balloon. The "greenhouse" is closed and its warming air can't escape. Eventually the heat will pass through the jar and lid to the outside environment, until equilibrium is reached. But this process is much slower than the cooling process in the open jar.

Discuss this with your students, and ask them to relate this experiment to CO2 in the earth's atmosphere.

## ENRICHMENT:

Build hotboxes using cardboard and plastic wrap. Start seedlings in and out of hotboxes and compare their growth daily.





# SUSTAINED USE OR ABUSE?

## ACTIVITY OBJECTIVE:

Students will demonstrate the ability to classify products and land-use practices as "sustainable use" or "abuse" with respect to environmental integrity.

Concepts: 1.1-1.3, 1.5-1.7, 1.10-1.14
Processes: 2.1, 2.3, 2.5, 2.6, 2.12, 2.15

## VOCABULARY:

- abuse
- sustained use

## MATERIALS:

"Sustained Use Or Abuse" data sheet; tour through the Kongo Ranger Station, in the African Rainforest Exhibit, at the Zoo.

## ACTIVITY DIRECTIONS:

1. Introduce and/or review vocabulary words and discuss briefly.
2. Give students "Sustained Use or Abuse" data sheets and pencils.
3. As they visit the Kongo Ranger Station, have students examine the exhibits and text for descriptions, photos, replicas, or samples of products that are derived from tropical rainforests or savannah.
4. Each of these is to be classified on the data sheet as to origin (savannah, rainforest), and use (sustained use or abuse). An added column allows room for students to list reasons justifying their use designation.
5. Afterward, in the classroom, discuss the students' work. For every "abuse" observation, encourage the students to discuss whether and how such practices should be banned, or managed in a sustainable way.

## ENRICHMENT:

Apply this "sustained use v.s. abuse" discussion format to our nation's energy and resource utilization. How might we more closely approach a sustained-use lifestyle?

126

# "SUSTAINED USE OR ABUSE" DATA SHEET

(For use at the Kongo Ranger Station)

**ACTIVITY DIRECTIONS:**

Classify each product or land use practice you observe at the Kongo Ranger Station. Is it from savannah or tropical rainforest? Does it represent sustained use or abuse? Why?

| | NAME OF PRODUCT OR PRACTICE | SAVANNAH OR RAINFOREST? | SUSTAINED USE OR ABUSE? | WHY? |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

# HELP THE EARTH

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will analyze things that are harmful to the earth's environment and think of alternative things to use.

Social Studies CCG's: 6.1, 6.2, 7.3, 7.4, 8.1.

### MATERIALS:

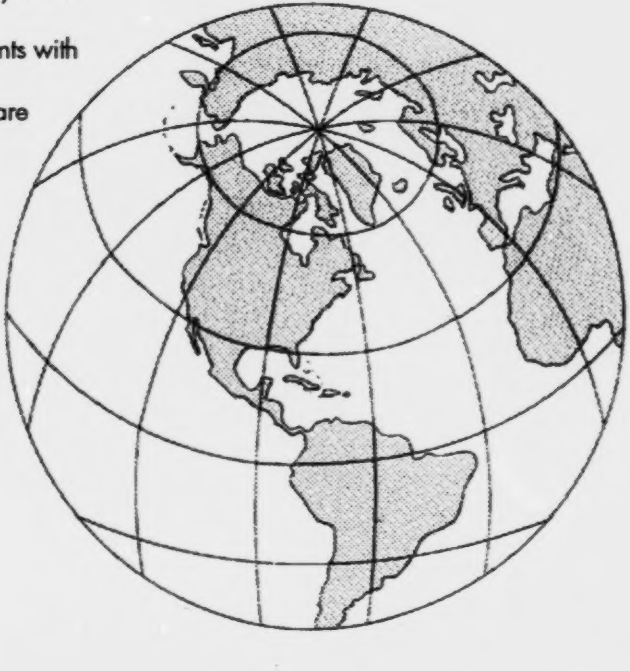
- Copies of the Help the Earth Activity.
- pencils/pens

### ACTIVITY DIRECTIONS:

- Have students work independently or in groups to complete the activity.
- Use the answer key to help students with possible answers.
- Students should share and compare answers.

### ENRICHMENT:

- Think of other items that are harmful to the earth's environment. Make posters illustrating alternatives that are more earth-friendly.
- Write a persuasive letter to a newspaper asking people to change their buying patterns.



## HELP THE EARTH

Think of alternative thing(s) to buy for each item listed as harmful to the Earth's environment.

| **HARMFUL TO THE EARTH'S ENVIRONMENT DO NOT BUY THESE THINGS** | **FRIENDLIER TO THE EARTH'S ENVIRONMENT DO BUY THESE THINGS** |
|---|---|
| plastic bags | ______________________ |
| canned sodas with plastic rings | ______________________ |
| disposable razors | ______________________ |
| aerosol spray deodorant cans | ______________________ |
| anything made of styrofoam | ______________________ |
| plastic knives, spoons, and forks | ______________________ |
| paper towels | ______________________ |
| plastics containers for food | ______________________ |
| cleaning supplies in plastic containers | ______________________ |
| disposable diapers | ______________________ |
| disposable batteries | ______________________ |
| disposable pens | ______________________ |
| disposable lighters | ______________________ |
| plastic Christmas trees | ______________________ |

## HELP THE EARTH

| **HARMFUL TO THE EARTH'S ENVIRONMENT**<br>**DO NOT BUY THESE THINGS** | **FRIENDLIER TO THE EARTH'S ENVIRONMENT**<br>**DO BUY THESE THINGS** |
|---|---|
| plastic bags | reusable cloth and string bags |
| canned sodas with plastic rings | sodas in cardboard boxes |
| disposable razors | electric razors |
| aerosol spray deodorant cans | roll-on stick deodarant |
| anything made of styrofoam | ceramic/glass cups, plates, bowls... |
| plastic knives, spoons, and forks | metal knives, spoons, and forks |
| paper towels | cloth towels |
| plastics containers for food | glass or aluminum containers for food |
| cleaning supplies in plastic containers | cleaning supplies in glass, cardboard, or aluminum |
| disposable diapers | cloth diapers |
| disposable batteries | re-chargeable batteries |
| disposable pens | fountain pens |
| disposable lighters | matches |
| plastic Christmas trees | living plants or Christmas trees |

# ACTIVITIES
# FOR
# GRADES 6-8

✻ LAY OF THE LAND ✻

△ HOME SWEET HOME △

● A DIVERSE CAST OF PLAYERS ●

◈ GET A LIFE! ◈

◆ CARING NOW FOR THE FUTURE OF LIFE ◆

# LAY OF THE LAND

# GRADES 6-8

THE LAY OF THE LAND section has activities to choose from including identifying countries in West, Central, and East Africa, and knowing which countries are located in the rainforest or savannah regions. In addition to using resource maps, students will use a database of information about countries in Africa to understand the lay of the land of Africa. The final activity asks students to identify a specific country and to answer questions. Students will need to use research skills and develop oral or written reports of their findings.

The activities in this section are presented in several variations so that the classroom teacher and students can select the ones that best meet their instructional goals and objectives. After determining the focus of the class instruction based on student interest and on prior knowledge of African Countries, then select the activities that meet your classroom needs. Another options is to assign different activities to groups or individuals and have the information presented to the whole class. In order to adapt activities to meet the instructional level of all students, you may wish to use some of the activities from the 3rd-5th grade LAY OF THE LAND section. The activities in this section are described below:

### COUNTRIES OF AFRICA DATABASE

- A listing of African countries and information.

### COUNTRIES OF THE SAVANNAH AND RAINFORESTS

- This activity has students locating countries that lie in the Savannah and Rainforests regions of Africa.

### COUNTRIES OF THE SAVANNAH IN WEST, CENTRAL, AND EAST AFRICA

- This activity has students identify and locate countries of the Savannah and identify them by their location on the continent of Africa.

### AFRICAN COUNTRY PORTFOLIO

- Students use research skills to learn more about a specific country in Africa.

# COUNTRIES OF AFRICA DATABASE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will learn about African countries, including the flag, capital city, total area, population-density, national language, local currency, date of independence, and status and name in colonial times of the countries.

Social Studies CCG's: 1.2, 1.5, 2.1, 2.3, 3.5, 4.2, 4.4, 4.5, 6.1, 6.3, 6.5, 7.3, 8.1.

### VOCABULARY:

- area
- database
- population
- population density
- independence

### MATERIALS:

- Copies of the Countries of Africa Database.

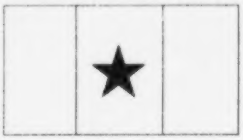
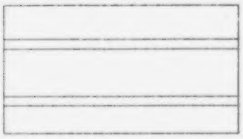
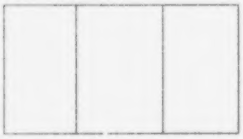
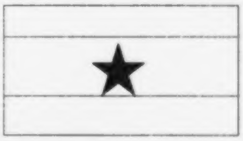
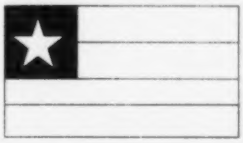
### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have students work individually or in groups to learn about the African countries.
- Have individuals or groups sort the countries by different characteristics such as: the largest in square mileage, greatest population, spoken languages, date of independence, etc.

### ENRICHMENT:

- Have students add other information to the database.
- Have students select one country to study in greater depth (see African Country Portfolio).
- Have students enter information into a computer database, sort information by different criteria, and create reports.

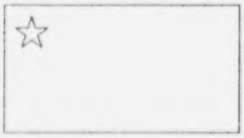
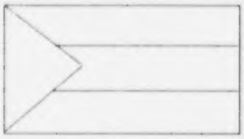
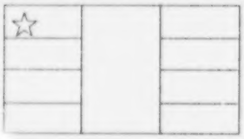
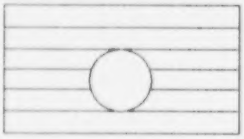
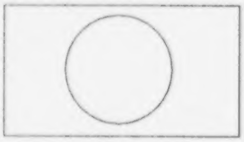
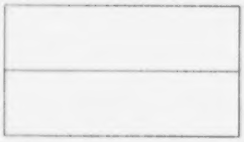
## WEST AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Senegal |  | Drakav | 75,750 sq. miles | 6,100,000<br>81 per sq. mile |
| Gambia |  | Banjul | 4,361 sq. miles | 600,000<br>138 per sq. mile |
| Guinea |  | Conakry | 94,926 sq. miles | 5,400,000<br>57 per sq. miles |
| Sierra Leone | | Freetown | 27,669 sq. miles | 3,800,000<br>137 per sq. mile |
| Liberia | | Monrovia | 43,000 sq. miles | 2,100,000<br>49 per sq. mile |
| Ivory Coast | | Abidjan | 124,504 sq. miles | 8,900,000<br>71 per sq. mile |
| Ghana |  | Accra | 92,100 sq. miles | 13,900,000<br>151 per sq. mile |
| Togo |  | Lome | 21,622 sq. miles | 2,800,000<br>129 per sq. mile |

## WEST AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| French;<br>Wolof, Fulani | 1 Franc CFA = 100 centimes | Aug.20, 1960 | 1659-1958: French Territory, 1958-1960: Mem. French Com. |
| Portuguese;<br>Balante, Fulani, Mandyako, Malinke | 1 Guinea peso = 100 centavos | Sept. 10, 1974 | 1879-1951: Portuguese Colony, 1951-74 overseas Prov. of Portug. |
| French; Mandinke Fulani, Soso, Loma | 1 Styli = 100 cauris | Oct. 2, 1958 | French Colony (French Guinea) |
| English;<br>Krio, Mende Temne | 1 Leone = 100 cents | April 27 1961 | 1787-1961: British Colony (Sierra Leone) |
| English | 1 Liberian dollar = 100 cents | Not Applicable | Independent |
| French; Malinke | 1 Franc CFA = 100 centimes | Aug. 7, 1960 | 1893-1960: French Colony (part of French West Africa) |
| English; Akan, Ewe | 1 New Cedi = 100 pesewas | March 6, 1957 | British Colony (The Gold Coast) |
| French; Ewe, Mina DaGomba,Tim, Cabrias | 1 Franc CFA = 100 centimes | April 27, 1960 | 1894-1918: German Colony (Togoland), 1919-1960: UN |

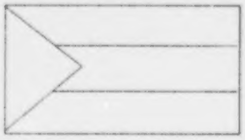
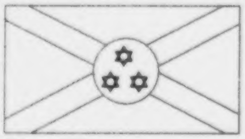
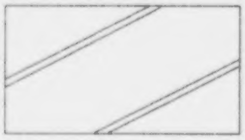
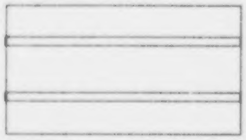
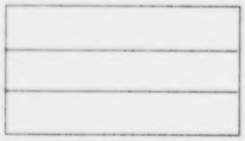
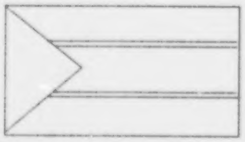
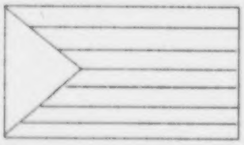
## CENTRAL AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Benin |  | Porto Novo | 43,484 sq. miles | 3,800,000<br>87 per sq. mile |
| Nigeria | | Lagos | 356,669 sq. miles | 84,200,000<br>236 per sq. mile |
| Cameroon | | Yaounde | 183,569 sq. miles | 9,100,000<br>50 per sq. mile |
| Equatorial Guinea |  | Malabo | 10,830 sq. miles | 300,000<br>28 per sq. mile |
| Central African Republic |  | Bangui | 240,535 sq. miles | 2,500,000<br>10 per sq. mile |
| Uganda |  | Kampala | 91,134 sq. miles | 13,800,000<br>151 per sq. mile |
| Zaire |  | Kinshasa | 905,568 sq. miles | 31,300,000<br>35 per sq. mile |
| Angola |  | Luanda | 481,354 sq. miles | 7,600,000<br>16 per sq. mile |

## CENTRAL AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| French; Fon, Mina, Yoruba, Dendi | 1 Franc CFA = 100 centimes | Aug. 1, 1960 | French Colony (Part of French West Africa) |
| English; Hausa, Fulani, Yoruba, Igbo | 1 Naira = 100 kobo | Oct. 1, 1960 | 1900-1960: British Colony (Nigeria) |
| French; English | 1 Franc CFA = 100 centimes | Jan. 1, 1960 (French Trusteeship)<br>Oct. 1, 1961 (British Trusteeship) | 1884-1914: German<br>1914-1916: British/German<br>1916-1946: French<br>1946-1961: UN. |
| Spanish | 1 ekuele = 100 centimes | Oct. 12, 1968 | Spanish Colony (Spanish Guinea) |
| French; Sango, Zande | 1 Franc CFA = 100 centimes | Aug. 13, 1960 | French Colony (Part of French West Africa) |
| English; Swahili | 1 Uganda shilling = 100 cents | Oct. 9, 1962 | 1893-1962: British protectorate (Uganda) |
| French; Lingala, Swahili, Tshiluba, | 1 Zaire = 100 Makuta | June 30, 1960 | 1884-1907: Congo Free State (Belgian), 1907-1960: Belgian |
| Portuguese; Umbundu, Kimbundu | 1 Kwanza = 100 Lwei | Nov. 11, 1975 | Portuguese Colony 1972-1975 overseas province: Angola |

## EAST AFRICAN COUNTRIES

| COUNTRY | FLAG | CAPITOL CITY | TOTAL AREA | POPULATION DENSITY |
|---|---|---|---|---|
| Sudan |  | Khartoum | 967,500 sq. miles | 20,600,000<br>21 per sq. mile |
| Burundi |  | Bujumbura | 10,747 sq. miles | 4,500,000<br>419 per sq. mile |
| Tanzania |  | Dar es Salaam | 364,900 sq. miles | 20,500,000<br>56 per sq. mile |
| Kenya |  | Nairobi | 224,961 sq. miles | 18,600,000<br>83 per sq. mile |
| Zambia | | Lusaka | 290,586 sq. miles | 6,200,000<br>21 per sq. mile |
| Malawi |  | Lilongwe | 45,747 sq. miles | 6,800,000<br>149 per sq. mile |
| Mozambique |  | Maputo | 302,330 sq. miles | 13,100,000<br>43 per sq. mile |
| Zimbabwe |  | Harare | 150,804 sq. miles | 8,400,000<br>56 per sq. mile |

## EAST AFRICAN COUNTRIES

| NATIONAL LANGUAGE | LOCAL CURRENCY | DATE OF INDEPENDENCE | STATUS & NAMES IN COLONIAL TIMES |
|---|---|---|---|
| Arabic; English | 1 Sudanese lb = 100 piastres =1000 Milliemes | Jan. 1, 1956 | 1898-1955: Anglo-Egyptian Condominium (Sudan) |
| Rundi; French, Swahili | 1 Burundi Franc = 100 centimes | July 1, 1962 | 1890-1919: German Colony (Part of German Africa) |
| Swahili | 1 Tanzanian CFA = 100 centimes | Dec. 9, 1961 Tanganyika<br>Oct. 1, 1961 (British Trusteeship) | 1884-1919: German Colony (Part of German East Africa)<br>1919-1961: British Trust Territory |
| Swahili; English | 1 Kenya Shilling = 100 cents | Dec. 12, 1963 | 1895-1920: British Colony<br>1920-1963: Crown Colony & Protectorate |
| English; Bemba, Tonga, Nyanja, Lozi | 1 Zambian Kwacha = 100 ngwee | Oct. 24, 1964 | British Colony with the names N.W. Rhodesia & N.E. Rhodesia (1895 -1911)<br>1911-1963 - Northern Rhodesia |
| English; Chichewa | 1 Malawi kwacha = 100 tambala | July 6, 1964 | 1891-1907: British Protectorate<br>1907-1953: Nyasa Land Protectorate<br>1953-1963: Member of CAF |
| Portuguese | 1 Mozambique escudo = 100 centavos | June 25, 1975 | 1505 -1952: Portuguese Colony<br>1952-1972: overseas Province |
| English; Shona, Ndebele | 1 dollar = 100 cents | April 18, 1980 | 1890-1923: British Colony<br>1923-1953: Self-governing<br>1953-1965: Member of CAF<br>1965-1979: Illegal independence<br>1979-1980: British Colony |

# COUNTRIES OF THE SAVANNAH AND RAINFORESTS

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries of the savannah and rainforests and label them on a map of Africa based on the information about countries in West Africa, Central Africa, and East Africa located in the Countries of Africa Database.

Social Studies CCG's: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### VOCABULARY:

- review vocabulary from previous activities

### MATERIALS:

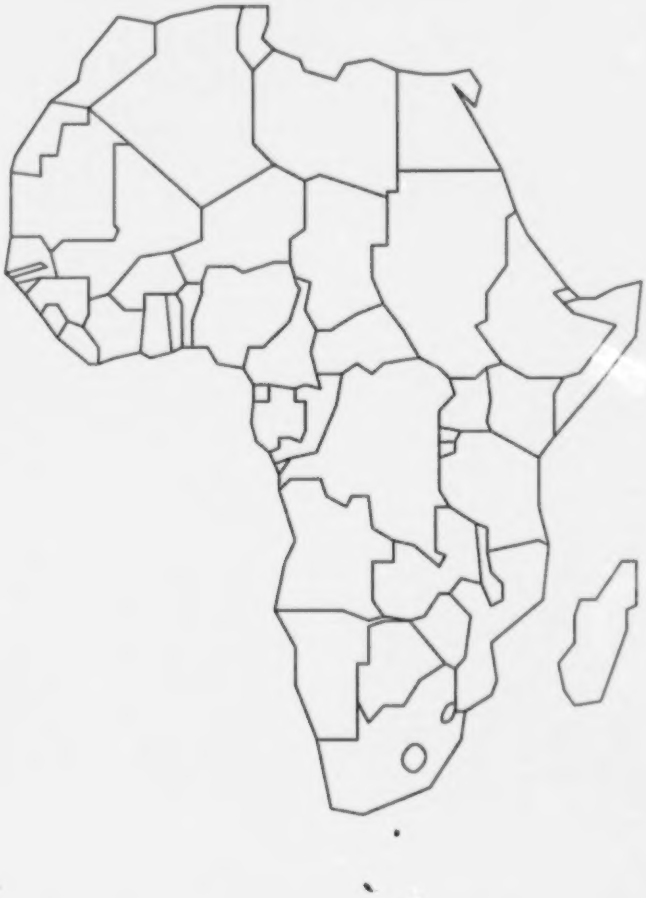
- Maps of Africa.
- Copies of the student directions for Countries of the Savannah and Rainforests.
- Copies of the Countries of Africa Database.

### ACTIVITY DIRECTIONS:

- Review activity vocabulary.
- Have students work individually or in groups to complete the activity sheets using a map of Africa and the Countries of Africa Database.
- Have students create their own questions for each other to answer based on the information in the Countries of Africa Database.
- Have individuals or groups share their answers and make corrections.
- Locate and label the countries on an outline map of Africa.

# COUNTRIES OF THE SAVANNAH AND RAINFORESTS

- Using the information in the Countries of Africa Database, write questions for other students to answer.
- Share the questions with your classmates.
- Answer the questions.
- Using a map of Africa, locate and lable on a map the countries in West Africa, Central Africa, and East Africa from the Countries of Africa Database.



# COUNTRIES OF THE SAVANNAH IN WEST, CENTRAL, AND EAST AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to locate countries that lie within the savannah region of Africa.

Social Studies CCG's: 3.1, 3.2, 6.1, 6.2, 6.3, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

- Maps of Africa showing countries.
- Climate and vegetation maps of Africa from atlas or textbooks.
- Copies of the outline map of African Countries.
- Copies of the student information for Countries of the Savannah.
- Pencils
- Colored pencils

### ACTIVITY DIRECTIONS:

- Have students work individually or in groups to complete the activity sheets using maps of Africa showing countries, climate and vegetation.
- Have students color their maps to show the savannah regions in these countries.
- Have individuals or groups share their answers and make corrections.

### ENRICHMENT:

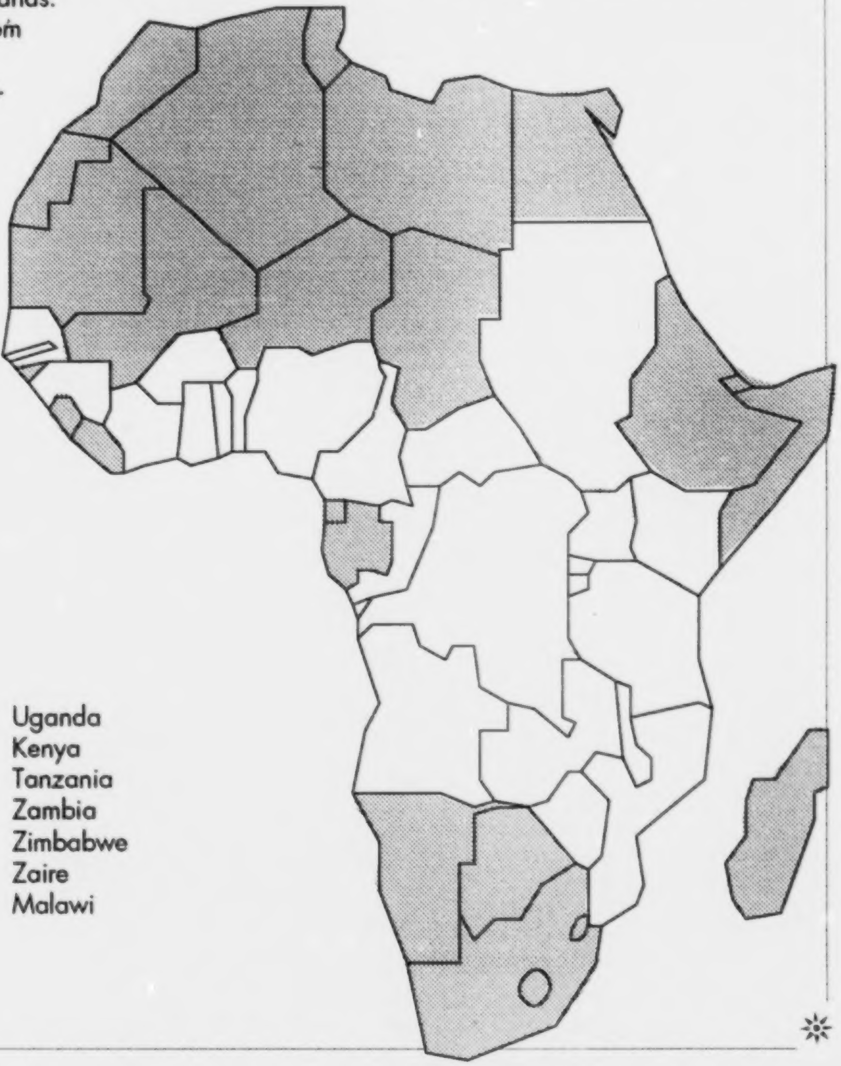
- Students could identify and study a specific savannah country.
- Have students create another map identifying countries with rainforest regions.

# COUNTRIES OF THE SAVANNAH IN WEST, CENTRAL, AND EAST AFRICA

The African savannahs lie both north and south of the African rainforests. Savannahs are broad grasslands with scattered, flat-topped trees. The savannahs cover nearly half of the continent of Africa. Most of the savannah gets little rain, but in the areas of the savannah that receive rainfall, clumps of trees stand close together.

The most common vegetation is the tall coarse grass. The outer edges of the savannah is the "veld". This has short grasses mixed with shrubs. South of the great Sahara Desert is a large area of savannah and veld called the Sudan Grasslands. This grassland stretches almost from coast to coast. Most of Africa's savannahs lie in the Sudan Grasslands and parts of Central and Eastern Africa.

Locate and label the countries of the Savannah Region on the outline map of Africa.



## COUNTRIES OF THE AFRICAN SAVANNAH

Angola
Senegal
Gambia
Guinea
Ivory Coast
Burkina Faso
Camaroon
Ghana
Togo
Mozambique
Benin
Nigeria
Central African Republic
Sudan
Rwanda
Burundi
Uganda
Kenya
Tanzania
Zambia
Zimbabwe
Zaire
Malawi

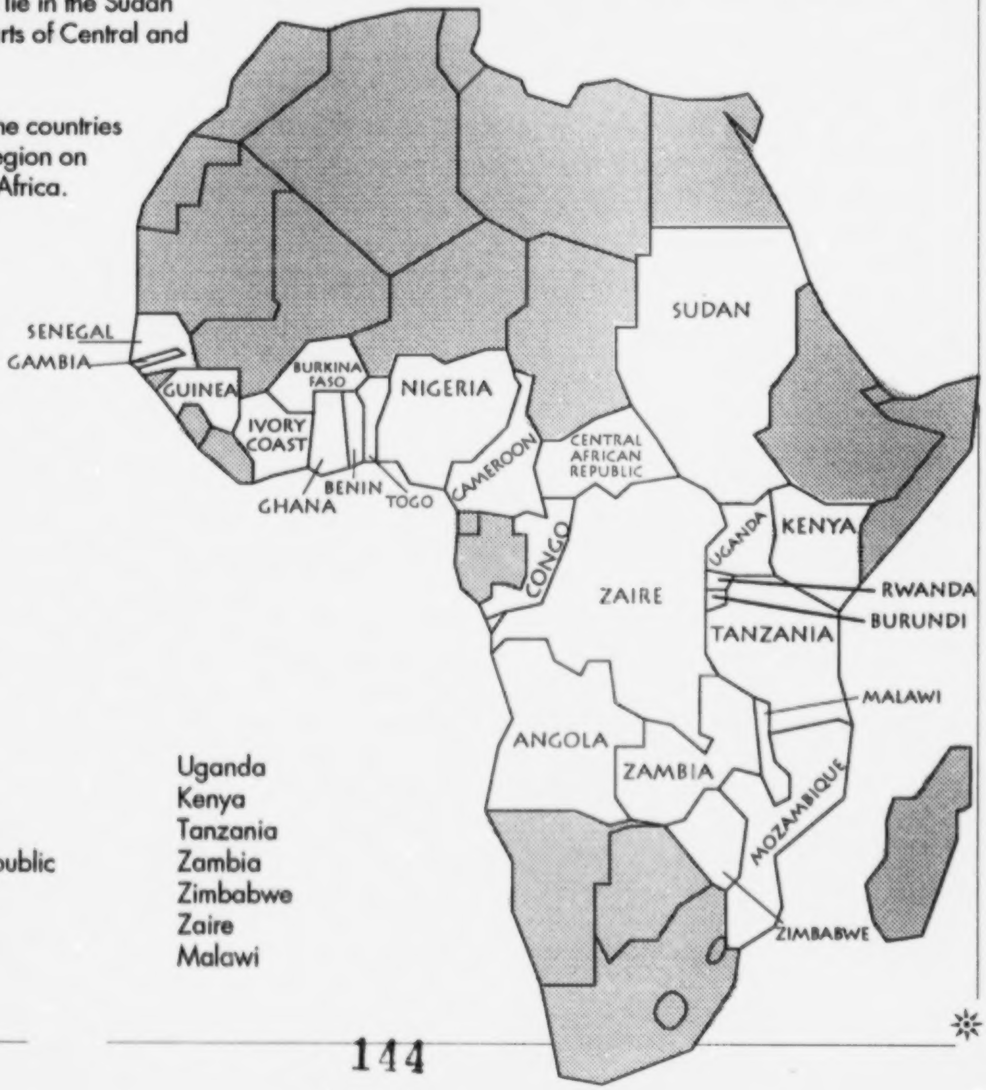
# COUNTRIES OF THE SAVANNAH IN WEST, CENTRAL, AND EAST AFRICA

## Answer key

The African savannahs lie both north and south of the African rainforests. Savannahs are broad grasslands with scattered, flat-topped trees. The savannahs cover nearly half of the continent of Africa. Most of the savannah gets little rain, but in the areas of the savannah that receive rainfall, clumps of trees stand close together.

The most common vegetation is the tall coarse grass. The outer edges of the savannah is the "veld". This has short grasses mixed with shrubs. South of the great Sahara Desert is a large area of savannah and veld called the Sudan Grasslands. This grassland stretches almost from coast to coast. Most of Africa's savannahs lie in the Sudan Grasslands and parts of Central and Eastern Africa.

Locate and label the countries of the Savannah Region on the outline map of Africa.


SENEGAL
GAMBIA
GUINEA
BURKINA FASO
IVORY COAST
GHANA
BENIN
TOGO
NIGERIA
CAMEROON
CENTRAL AFRICAN REPUBLIC
SUDAN
CONGO
ZAIRE
UGANDA
KENYA
RWANDA
BURUNDI
TANZANIA
MALAWI
ANGOLA
ZAMBIA
MOZAMBIQUE
ZIMBABWE

### COUNTRIES OF THE AFRICAN SAVANNAH

Angola
Senegal
Gambia
Guinea
Ivory Coast
Burkina Faso
Camaroon
Ghana
Togo
Mozambique
Benin
Nigeria
Central African Republic
Sudan
Rwanda
Burundi
Uganda
Kenya
Tanzania
Zambia
Zimbabwe
Zaire
Malawi

# AFRICAN COUNTRY PORTFOLIO

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to select an African country to study.

Social Studies CCG's: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1.

### VOCABULARY:

- portfolio
- historical sketch
- demographic
- graphic-relief

### MATERIALS:

- Copies of the student directions for the African Country Portfolio.

### ACTIVITY DIRECTIONS:

- Review vocabulary.
- Provide students with the directions to complete the African Country Portfolio.
- Have students share their portfolios.

### ENRICHMENT:

- Develop other questions that students would like to research.
- Have students share their information in a speech, drama, art display, video, or some other appropriate manner.

# AFRICAN COUNTRY PORTFOLIO

## Student Directions

1. Choose a country in Africa that you want to know more about.

2. Make a cover for your portfolio that includes the country's national flag —use the proper colors and design.

3. Prepare two of the following types of maps on your country: political, graphic-relief, historical, economic, demographic, scientific, or climate.

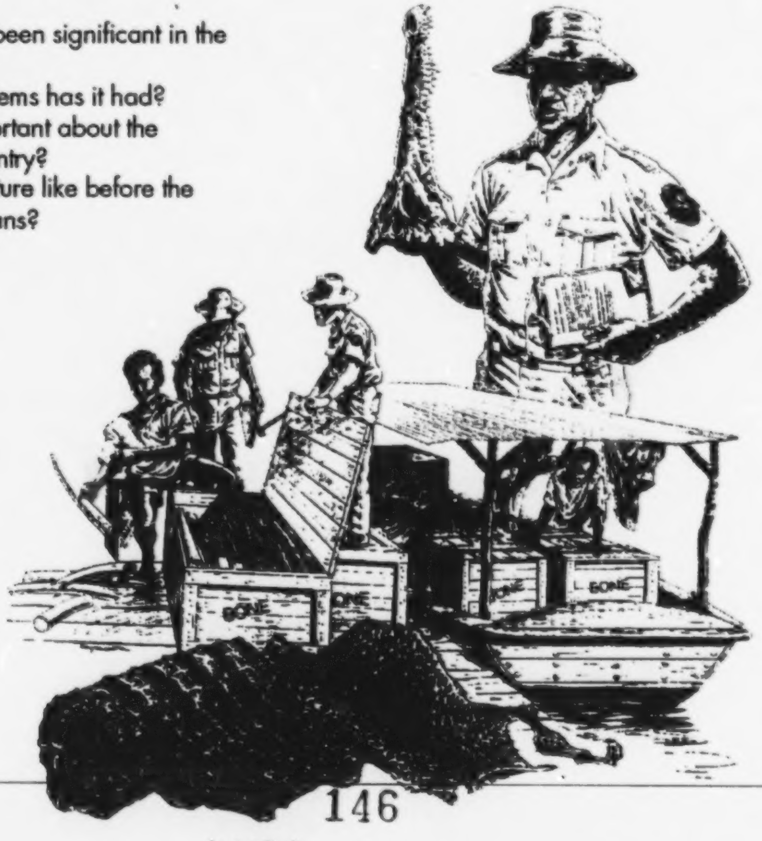
4. Write a brief historical sketch on your country'.
   Answer the following:

   A. Who settled the country, when, and why?
   B. What wars have been significant in the country's history?
   C. What world problems has it had?
   D. What else is important about the history of this country?
   E. What was the culture like before the arrival of Europeans?

5. Write a brief sketch on the current politics that are occurring in your country?
   Answer the following:

   A. What form of government does this country have?
   B. What are its current political problems?
   C. What is its role in world politics?
   D. What current events are presently affecting the operation of this country?

6. Choose two of the following to include in your portfolio: religions, customs, traditions, costumes, music, foods, arts, architecture, ethnic groups.



# HOME SWEET HOME

△

## GRADES 6-8

HOME, SWEET HOME focuses on the characteristics of the rainforest and the savannah habitats. These activities are designed to increase the students' awareness of the climate of the regions and how the climate affects the habitats of the animals and people of Africa.

After determining the focus of study, select from the activities in this section. Students may complete the activities individually or in groups and present the information to the whole group. The activities in this section are described below:

### TROPICAL RAINFORESTS: EARTH'S LIVING TREASURES

- Provides information about the Tropical Rainforests.

### ON THE SAVANNAH

- Students locate African Savannah on a map of Africa, study the savannah's climatic conditions, and learn about the basic ecology of the savannah.

### AFRICAN SAVANNAH CLIMATE

- Students learn about the average temperature and amount of rainfall on the African Savannah.

### IMPALA*

- This activity emphasizes the most essential things that animals need in order to survive: food, water, shelter, and space.

### TRADITIONAL SAVANNAH HOUSING*

- Students learn about traditional savannah housing.

### BUILDING A BIOME

- Students make model biomes of the desert, grassland, deciduous forest and rain forest and see how well different plants grow in each.

### OBSERVING A RAINFOREST STORM*

- Students observe and make note of changes in the tropical environment and animal behavior during a storm.

### AFRICAN HABITAT MODELS*

- Students demonstrate their understanding of savannah and tropical rainforest habitats and microhabitats of Africa and knowledge of the diverse animal life therein by creating scale models with relative accuracy.

BEST COPY AVAILABLE

# TROPICAL RAINFORESTS EARTH'S LIVING TREASURES

## Teacher Information

### OBJECTIVES:

Students will demonstrate the ability to
- understand that tropical rainforests support diverse plant and animal life.
- understand that humans obtain many resources from tropical rainforests.
- understand that scientists still know very little about life in tropical rainforests.
- understand climatic conditions necessary for tropical rainforests to exist.
- understand that tropical rainforests grow in distinct layers.

CONCEPTS: 1.1-1.8, 1.10-1.12, 1.14
PROCESSES: 2.6, 2.12, 2.15

### VOCABULARY:

adaptations, buttress roots, cacao, canopy, elevation, emergent, epiphytes, equator, forest floor, humid, tropical rainforest, Tropic of Cancer, Tropic of Capricorn, understory.

### MATERIALS:

"Tropical Rainforests—Earth's Living Treasures" student texts; "Rainforest Vocabulary Review" activity sheets.

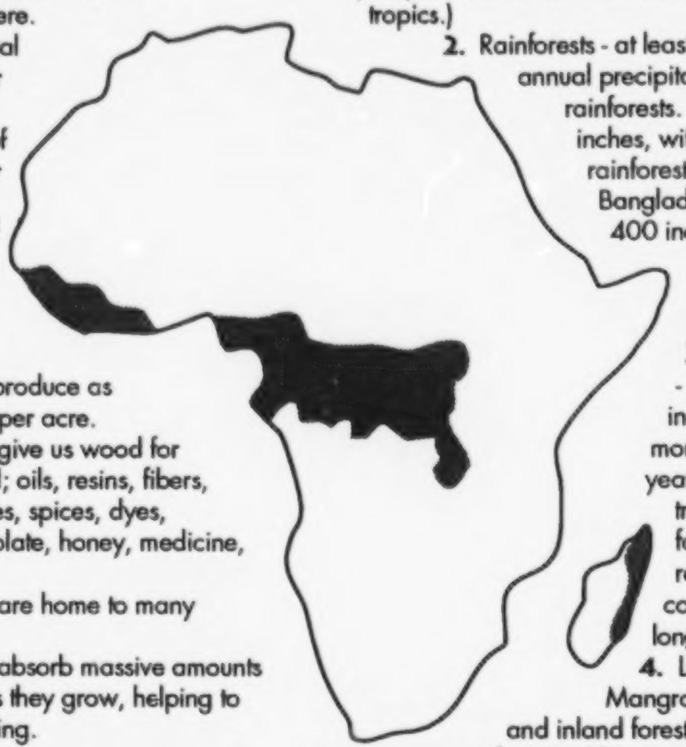
### ACTIVITY DIRECTIONS:

1. Introduce and/or review vocabulary words with your students.
2. Read "Tropical Rainforests—Earth's Living Treasures" together aloud as a class, stopping to discuss and clarify along the way.
3. Assign your students "Rainforest Vocabulary Review" activity sheets.

# TROPICAL RAINFORESTS EARTH'S LIVING TREASURES

Why are tropical rainforests living treasures? Here are a few reasons. They only cover 7% of the earth's surface, but consider...

- 80% of all plant life lives there
- diversity—perhaps 30 million species are found there.
- one hectare of tropical rainforest contain over 42,000 species of insects, 750 species of trees and 1,500 other higher plant species.
- one square yard of tropical rainforest may contain over 800 ants, of 50 species.
- no other land can produce as many pounds of life per acre.
- tropical rainforests give us wood for timber, pulp and fuel; oils, resins, fibers, nuts, fruits, vegetables, spices, dyes, rubber, chicle, chocolate, honey, medicine, and much more.
- tropical rainforests are home to many diverse peoples.
- tropical rainforests absorb massive amounts of carbon dioxide as they grow, helping to reduce global warming.



The map above shows the world's tropical rainforests as shaded areas. The African Tropical Rainforests are found in West and Central Africa, on Madagascar, and on the Comoros Islands.

There are many kinds of forests on earth, and even several varieties of rainforest. So what distinguishes tropical rainforests from other forests?

## TROPICAL RAINFORESTS ARE...

**1.** Tropical - located near the equator, between the Tropic of Cancer and the Tropic of Capricorn. (Temperate rainforests are found outside the tropics.)

**2.** Rainforests - at least 80 inches of annual precipitation must fall in rainforests. The average is 93 inches, with some tropical rainforests in Hawaii and Bangladesh receiving over 400 inches. Yet most days are sunny, with short, intense afternoon rains.

**3.** Wet Year-Round - If less than four inches of rain fall per month at any time of year, you may be in a tropical seasonal forest. Tropical rainforests have wet conditions all year long.

**4.** Low in elevation - Mangrove swamps, coastal and inland forests may be tropical rainforests. Montane forests and cloud forests grow in high elevations, under different conditions.

**5.** Hot and Humid - All day, all night, all year! Temperatures range 70-85 degrees F, changing very little. Humidity (moisture in the air) averages 70% by day and 95% at night, with many days at saturation, or 100%. It feels like the inside of a greenhouse. Day length varies about one hour per year. Most days and nights are 12 hours long and the sun is almost directly overhead.

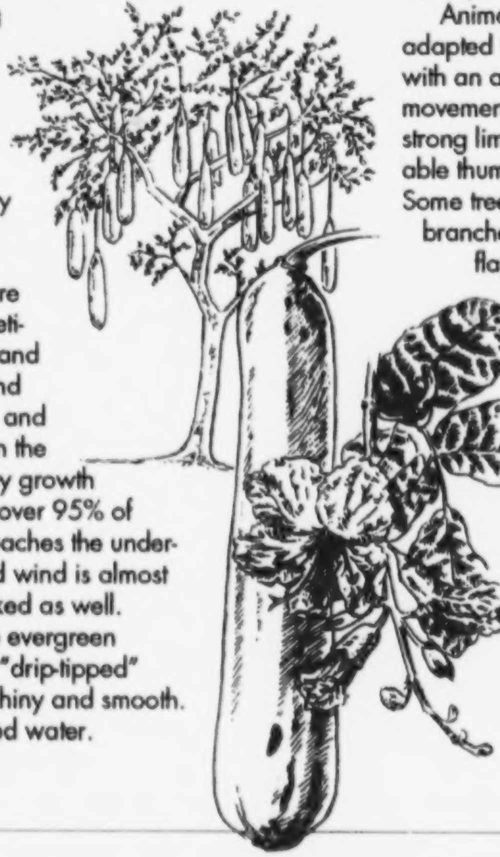
The seasons are more alike than different. It's one long growing season.

The life of the tropical rainforests grows in layers. These layers are called forest floor, understory, canopy and emergent.

**Emergents** are huge trees that rise well above the canopy, with two or three per acre. They range between 150 - 250 feet in height, and usually don't extend branches until they have cleared the canopy. Shallow soils don't allow deep root penetration, so emergents and other trees spread roots out from the trunk for support. Giant buttress roots ten feet tall fan out all directions from the emergents liked sloped walls.

Life in the emergent crowns is exposed to high wind, hard rain and hot sun. Eagles, touracos, other birds, some monkeys and other smaller animals live in the emergents. They must either be adapted to flight or climbing. The trees are often wind-pollinated, and form winged or floating seeds for wind dispersal.

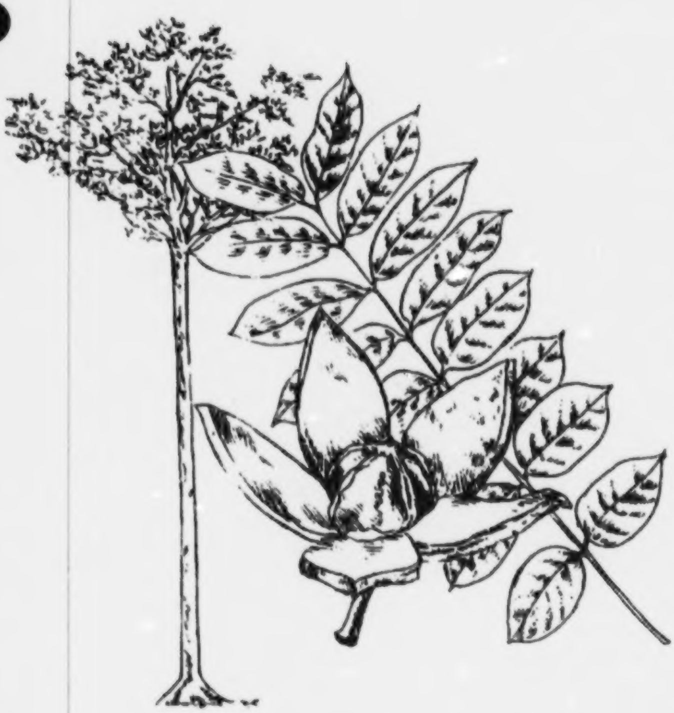
The **canopy** looks like a sea of broccoli tops, formed by the crowns of trees growing 65 - 100 feet high. Crown foliage averages 20 feet deep, and the trees branch very little below this. Trees and other canopy plants are in intense competition for sunlight and space above, and nutrients, water, and rooting space on the ground. Canopy growth is so dense that over 95% of sunlight never reaches the understory below, and wind is almost completely blocked as well.



The trees are evergreen broadleafs with "drip-tipped" leaves that are shiny and smooth. These leaves shed water. If the leaves remained wet, moss and algae would grow on them. The weight of that growth and water could bring trees down! The trees also form a skeleton for other rainforest life. Climbing plants and vines such as the strangler fig use trees for support, and climb them to reach the sunlight above. Thousands of species of epiphytes grow on branches throughout the canopy. Epiphytes are hanging plants with no true roots. They obtain nutrients form the air. Up to half of the canopy's nutrients are found in epiphytes!

Some epiphytes slow down their life processes in dry times, to conserve water. Most bromeliads are epiphytes, and they are shaped to catch rain and store water in "ponds" that can hold up to two gallons. Some, such as the pitcher plant, catch and digest insects in watery pools, to obtain needed nutrients. Smaller animals and aquatic plants can live in these microhabitats of the canopy. Some trees have adapted ways to rid themselves of heavy epiphytes, such as shedding the bark they attach to, or releasing chemicals that prevent seeds from sprouting on their bark.

Animals of the canopy (and understory) have adapted to life in the trees. They are equipped with an array of structures or behaviors suited to movement in the treetops. Monkeys have long, strong limbs, strong hands and feet with opposable thumbs and opposable toes for grasping. Some tree frogs use suction-cup feet to hang onto branches and leaves. Flying squirrels have skin flaps between arms and legs that enable them to glide. Some monkeys leap up to 50 feet through the air from branch to branch. Most canopy-dwelling animals are small or mid-sized and very strong and agile. Large body size is an adaptation that is more successful on the ground. Most canopy food is leaves and plant parts, so most animals eat these, with few large predators. Most monkeys eat leaves and fruits, but will eat eggs, insects and small animals when they are available.



The **understory** is made of trees, shrubs and tree ferns that are widely scattered and ten to fifteen feet tall. They must be able to survive in dim light. Some are truly shade tolerant plants that live out full life cycles in the understory. Others are the seedlings of canopy or emergent species of trees. These often are adapted to "waiting" for several years for space to occupy in the canopy. They grow slowly, and must wait for a large tree to fall. Then they grow rapidly, tall and thin, competing with other trees to reach the space in the canopy. Only after arriving will the tree grow thicker and branch extensively. Understory air is calm, and wind pollination is not possible. Brightness, color, and odor are used by flowers here to attract animal pollinators such as insects, birds, bats, and other small creatures.

Early European explorers of tropical rainforests believed that the **forest floor** was dense with vegetation. They called the forests jungles, which comes from an ancient Sanskrit word "jangala", meaning "vegetation too dense to penetrate." The explorers travelled up rivers in boats, and judged the forest floor by what they saw on the river's edge; thick vegetation. But vegetation grows thick anywhere there is available light and water, such as on river banks. Walking into the forest 50 meters, the vegetation thins dramatically, and it gets dark. The forest floor is quite open.

Large tree trunks rise to and beyond the canopy high overhead. Giant buttress roots and stilt roots reach out to support the trees in shallow soil. Roots extend everywhere on the ground, reaching for nutrients and water. The air is calm, warm and moist—perfect for bacteria and fungi. In fact, germs grow so well here that scratches and cuts take much longer to heal than in temperate latitudes. And when plants and animals die, they decompose quickly. Organic matter is consumed again and again by larger animals, small animals, fungi, bacteria, until it is washed into the soil. And it doesn't last long there because whatever nutrients aren't quickly absorbed by tree roots are washed away by the heavy rains. A dead okapi (elk-sized relative of the giraffe) would completely disappear within two weeks!

# TROPICAL RAIN FORESTS EARTHS LIVING TREASURES

## Vocabulary Review

E P I P H Y T E S X N O I T A T P A D A
D K F L V S S C E F B V Y E N H T E S O
P O L L I N A T O R S F C X R M C J T P
E O N W D N X A R B O S K O P O P T O W
H M Z R O V H I A X L T O I M A P N O B
E G E P O M K C J S R L A P O U W B R I
D L Y R O C T D D A F X O U X N Y C S T
I O X K G E I A I T N S C C Q D I M S K
X B E R R E I R S V I G B B A E T P E N
O A C I W L N E P T E J A D O R B R R O
I L A Y E K R T I A P R L L U S V E T I
D W R M T O O O S L C I S L A T S H T T
N A O Z F K N F R Y S F Y I S O L E U I
O R E C N A C F O C I P O R T R E N B T
B M I C R O H A B I T A T C X Y U S C E
R I N X Y T N K F Q F H O N I F M I D P
A N I W S T E H P E N S S E Z P G L O M
C G R N O P P O S A B L E Y F N O E E O
S T N E I R T U N S W N M A U E L R T C
Q T R O P I C A L R A I N F O R E S T C

### DIRECTIONS:

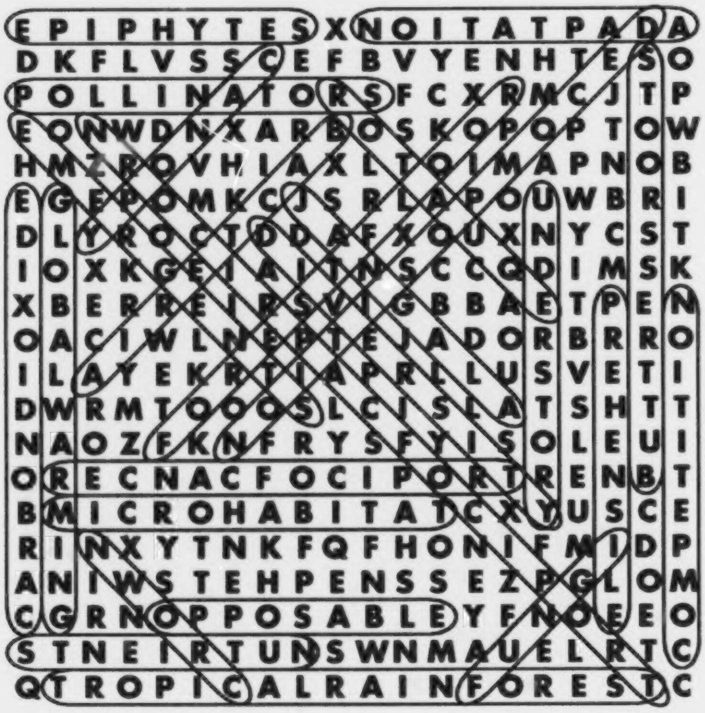
Fill in the missing terms that match the definitions below.
Then circle them in the wordfind.

1. Most plants and animals live here.
________ __________
2. Bottom of the rainforest.
______ _____
3. Huge roots of emergents.
________ _____
4. CO2. ______ _______
5. Tropic of the Northern Hemisphere
______ __ ______
6. Mostly in the canopy, not the soil.
_________
7. Rainforest's layer of life.______
8. Tail that can grasp.__________
9. Tropic of the Southern Hemisphere.
______ __ _________
10. Birds, bats, and insects.
___________
11. Sanskrit word for jungle._______
12. Tallest rainforest trees. _________
13. The struggle against others for resources.
___________
14. Treetop._____
15. This divides the hemispheres._______
16. Rainforest layer below canopy.
__________
17. Plants shaped to store water.
__________
(found only in South America)
18. Germs that decompose organic matter.
________
19. Many different species._________
20. Habitats within habitats.
____________
21. Hanging plants, without roots.
_________
22. Mushrooms, toadstools, molds, etc._____
23. CO2 is causing this.
______ _______
24. Body part or behavior that helps living things survive.__________
25. The process of decaying.
_____________

152

# TROPICAL RAIN FORESTS EARTHS LIVING TREASURES

## Answer Key



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E P I P H Y T E S X N O I T A T P A D A
D K F L V S S C E F B V Y E N H T E S O
P O L L I N A T O R S F C X R M C J T P
E O N W D N X A R B O S K O P O P T O W
H M Z R O V H I A X L T Q I M A P N O B
E G E P O M K C J S R L A P O U W B R I
D L Y R O C T D D A F X Q U X N Y C S T
I O X K G E I A I T N S C C Q D I M S K
X B E R R E I R S V I G B B A E T P E N
O A C I W L N E P T E J A D O R B R R O
I L A Y E K R T I A P R L L U S V E T I
D W R M T O O O S L C I S L A T S H T T
N A O Z F K N F R Y S F Y I S O L E U I
O R E C N A C F O C I P O R T R E N B T
B M I C R O H A B I T A T C X Y U S C E
R I N X Y T N K F Q F H O N I F M I D P
A N I W S T E H P E N S S E Z P G L O M
C G R N O P P O S A B L E Y F N O E E O
S T N E I R T U N S W N M A U E L R T C
Q T R O P I C A L R A I N F O R E S T C
```

1. tropical rainforest
2. forest floor
3. buttress roots
4. carbon dioxide
5. Tropic of Cancer
6. nutrients
7. canopy
8. prehensile
9. Tropic of Capricorn
10. pollinators
11. jangala
12. emergents
13. competition
14. crown
15. equator
16. understory
17. bromeliads
18. bacteria
19. diversity
20. microhabitats
21. epiphytes
22. fungi
23. global warming
24. adaptation
25. decomposition

# ON THE SAVANNAH

## ACTIVITY OBJECTIVES:

Students will demonstrate the ability to...

- locate the African Savannah
- understand the savannah's climatic conditions
- understand the basic ecology of the savannah

Concepts: 1.1-1.8, 1.10, 1.11, 1.12, 1.14
Processes: 2.6, 2.12, 2.15

## VOCABULARY:

- browsers
- carrion
- cellulose
- diversity
- drought
- enzymes
- forage
- germinate
- grazers
- herbivore
- locust
- malaria
- migrate
- mosquito
- niche
- nomadic
- predator
- prey
- protozoan
- resident
- savannah
- scavenger
- termites
- tsetse

## MATERIALS:

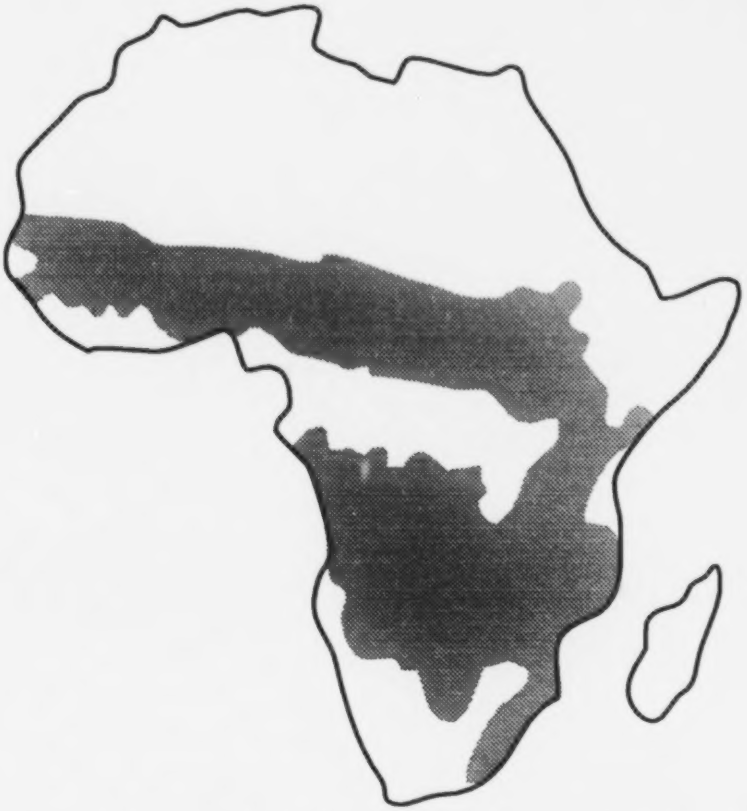
"On the Savannah" student texts; "Savannah Vocabulary Review" sheets.

## ACTIVITY DIRECTIONS:

1. Introduce and/or review vocabulary words at left with your students.
2. Read "On the Savannah" together aloud as a class, stopping to clarify and discuss along the way.
3. Assign your students "Savannah Vocabulary Review" sheets.

# ON THE SAVANNAH

The African Savannah covers vast stretches of sub-Saharan Africa. It is home to the world's greatest diversity of mammalian herbivores. Its tall grasses, scattered woodlands, lakes, rivers, and swamps support over 70 species of antelope, as well as elephants, rhinos, hippos, giraffes, ostriches, zebra, crocodiles, lions and many more animals. The map below shows African Savannah as shaded area.



As you can see, savannah dominates the landscape of Africa between the Sahara Desert and the great tropical rainforests of Central and West Africa. It is mainly grassland, with scattered shrubs and trees. Classic savannah supports grasses 2 to 3 meters tall. It has a six month rainy season and a six month dry season. Temperatures are hot by day (100 degrees F is common) and near freezing at night. Rainfall ranges between 20 and 60 inches per year, and nearly all of it falls in the rainy season during late afternoon thunderstorms. Rains are usually brief but very intense. Water is the key limiting factor on the savannah, since plants depend on it, and animals upon water and plants. Long dry seasons and periodic droughts also make the savannah susceptible to fire.

## FIRE

Lightning-caused fires have burned the savannah for millions of years. Many of the plants that grow here have adapted to fire. Some trees develop thick bark, and high branching arrangements, above the flames of the burning grasses. Others use fire to reproduce. Fire causes some plants to release seeds, and some seeds to germinate. Fire also clears the soil of organic matter that would prevent seeds from growing, turning it into ashes. Rains wash the ash into the soil, fertilizing it for plant growth.

People of the savannah have used fire for many centuries to clear the land. In woodland-savannah, fire encourages the grasses to occupy more space than the trees. People graze their cattle on these lands, and wildlife feed there, too. Human-caused fire has increased the size of the grasslands of Africa and actually helped make it possible for the wild herds to become as large as they have ever been. In national parks, however, people have prevented fire for decades, and the trees have slowly taken over more and more grassland.

## WATER

Savannah life revolves around the water supply. It is concentrated in drainage areas, permanent shallow lakes, rivers, swamps, and seasonal wetlands that evaporate in the dry season. As the dry season progresses, water becomes more scarce, and animals of the savannah gather around remaining sources. Swamps are too wet to burn in the fires, so their dead vegetation forms a dense mat over the water. This mat protects the water from the drying rays of the sun.

The savannah doesn't support a great diversity of amphibians or fish. Cichlids live in permanent waters, but catfish, African lungfish and killifish are common to the shallow and seasonal wetlands. Lungfish burrow deep in the mud and hibernate up to several years in dried lake bottoms. They breathe with lungs. Killifish live in seasonal waters and lay eggs in the mud before the lake dries, killing all of the adults. Giant bullfrogs are abundant across the savannah. The waters are filled with small invertebrates, frogs and fish as the rainy season begins. They are an important source of food to many birds, reptiles and mammals.

Animals of the savannah have adapted to water scarcity in several ways. Many conserve water internally, urinating less often, losing less water than other animals. Gazelles can live on the water they obtain from the plants they eat, as can several other grazing species. Night activity and daily rest is another behavior that saves water and energy. Seasonal migration is really a long-distance pursuit of food and water.

## INSECTS

Savannah life would soon grind to a halt without insects. They condition the soils and are an important part of the food web. Termite alates are hatched every rainy season by the millions. They are the winged kings and queens of future colonies; or at least the survivors are. Alates are large, and made of nearly half protein and half fat. They are eaten by snakes, lizards, tortoises, frogs, fish, birds and mammals, including humans. Termite mounds are passed down through tribal families as property. The people attract the alates with fire, luring them into small pits. They are then roasted over a fire, winnowed like grain to remove the glassy wings, and eaten. They taste something like peanut butter.

Termites and ants do the job of the earthworm in savannah soils, which are too dry for most worms. They tunnel deeply and extensively, opening the soil to air, water, animals and plant roots. They also mix different layers of the soil together, and add their wastes to it, making it fertile. Termites live in colonies of up to several million insects. They eat wood and plant fibers, but could not digest the cellulose without the help of tiny protozoans that live in their intestines, and enzymes they obtain by eating a special fungus that they farm underground in their nests. They even bring the fungus above ground when the rains come, so that it can reproduce, and then bring new fungus back inside the nest. The termites, fungus and protozoans could not survive without one another.

Most African ants live in colonies of several thousand. Some are ground-dwellers, some live in trees, and others are nomadic, always moving in search of food. Soldier ants move in a long column, with scouts ahead and to the sides, in search of prey, carrion, or any kind of food. They will eat other insects, small animals, and generally anything they can. At night they form a bivouac—a nest made of their own interlocked bodies. Numerous birds and small animals follow these ant columns, preying upon the animals the ants flush out of hiding. Whether hunters, foragers or harvesters, nearly all African ants have nasty bites!

Locusts are extremely destructive to any vegetation they find. These grasshopper-like insects can travel 2,000 miles per season, in swarms of 10 million. They eat their own body weight in plants every day, and form such dense clouds it is difficult to breathe among them. Mosquitoes carry a number of parasitic diseases to humans and other animals, among them malaria and yellow fever. Tsetse flies are blood-drinking, biting flies that carry Trypanosomes (parasitic protozoans) to cattle and people, causing sleeping sickness.

## HERDS

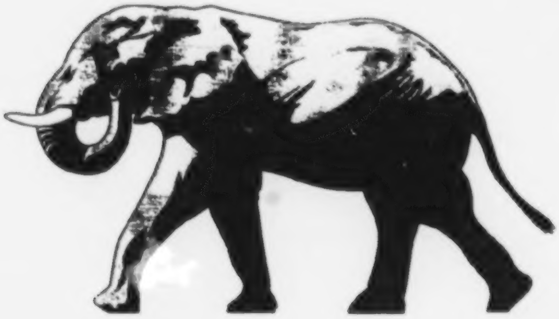
The huge mixed herds of the savannah are a puzzling sight. So many different species feed side by side without conflict or competition. One reason this is possible is the concept of multi-species forage. What this means is that over millions of years, these herbivores have adapted to specific niches within the savannah. An animal's niche is its place, or "job" in the food web. Within the savannah many more niches exist than you might think. Although standing side by side, many of these animals are ecologically separated, by their different niches. Here are some common differences:

1. Some species prefer the same plants, but live in different habitats, wildebeest and buffalo, for example.
2. Some species prefer the same plant, in the same habitat, but at different times of year, like Grant's gazelle and impala.
3. Grazers prefer grasses, while browsers eat leafy vegetation, like the zebra and the black rhinoceros.
4. Some species eat different parts of the same plant, due to differences in height, like giraffe and dik dik.
5. Some species eat different parts of the same plants regardless of plant size.

Gazelles offer an excellent example of occupying a niche. In the dry season, when heavier grazers concentrate at waterholes, gazelles stay in the drier grasslands, preferring the short-cropped grasses there. Gazelles need little water, and the heavy grazers could not get enough water or forage on these dry lands. When the rains come, the wildebeest, impala and others have eaten grasses to the ground at the waterhole. Now they leave for open country, where new, taller grasses are springing up. The gazelles don't like this new growth. They move to the waterhole, eating the already-grazed, short stubble left by the others.

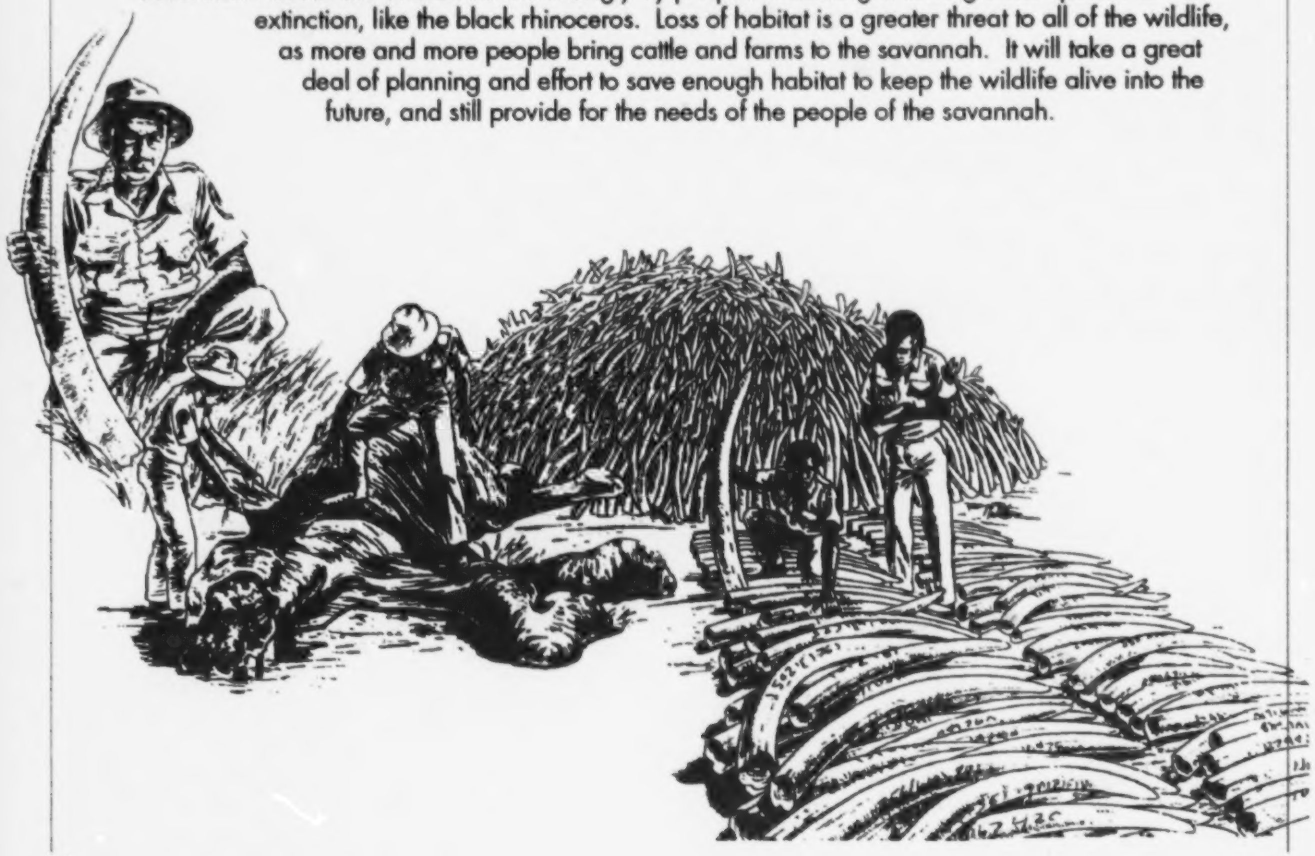
## PREDATORS AND SCAVENGERS

Predators hunt, kill and eat prey. Prey concentrate near water, and so do predators. Some predators are resident..lions occupy a territory as their own...Others, such as wild dogs, are nomadic. They follow the movements of herds. Lions, cheetahs, servals, caracals, hyenas, wild dogs, and other mammals will kill for some or all of their food. Nearly all of the reptiles are predators, including crocodiles, tortoises, chameleons, monitor lizards, spitting cobras and bull pythons. Many predatory birds live near the water, such as Hottentot teals, yellow-billed storks, African white spoonbills and grey-headed kingfishers. African lungfish, catfish and killifish are all predatory, eating small aquatic animals.

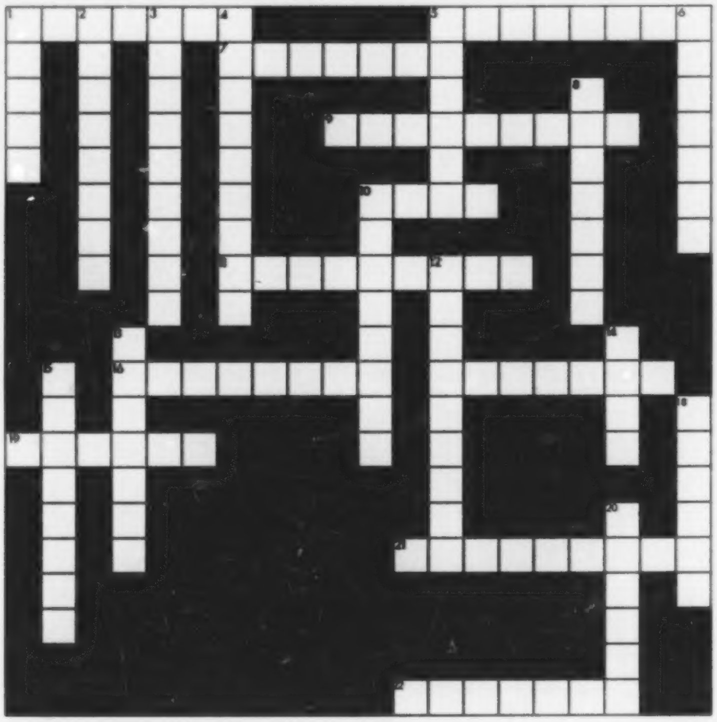


Scavengers are carrion-eaters by definition. On the savannah, hyenas, jackals, wild dogs, marabou storks and vultures are all scavengers. Yet so are lions, who pirate kills away from other predators. One study of the spotted hyena revealed interesting data, 1,052 observations were made at night of spotted hyenas eating. 82% were eating their own kills, 11% ate carrion killed by some other animal, and 7% were of unknown sources. By day, however, 34% of the hyenas observed were eating another predator's kill. Perhaps daylight observations led us to believe these animals to be mostly scavengers. The truth is that they are the top predators of the savannah in total kills.

Savannah wildlife are threatened increasingly by people. Poaching is driving some species to near extinction, like the black rhinoceros. Loss of habitat is a greater threat to all of the wildlife, as more and more people bring cattle and farms to the savannah. It will take a great deal of planning and effort to save enough habitat to keep the wildlife alive into the future, and still provide for the needs of the people of the savannah.



# SAVANNAH VOCABULARY REVIEW



**DIRECTIONS:** Use the clues to fill in the numbered blanks in the puzzle above.

## ACROSS

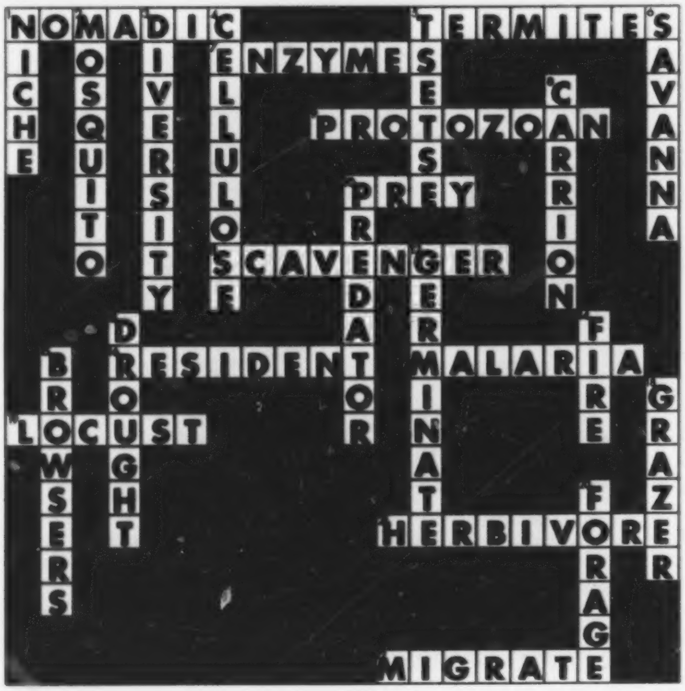
1. Without resident habitat.
5. Underground fungus farmers.
7. Chemicals that help break down food.
9. Microscopic organism in termite's belly.
10. Any hunted animal.
11. Any animal that eats dead animals.
16. Any animal that lives permanently in one territory.
17. Disease spread by mosquitoes.
19. Grasshopper-like insect.
21. Any plant eater.
22. Move with the seasons to find food.

## DOWN

1. An animal's job in the food web.
2. Insect that spreads malaria.
3. A great variety of species.
4. Protozoans help termites digest this.
5. Fly that spreads sleeping sickness.
6. Grassy plains of Africa.
8. Dead animal remains.
10. Any hunted animal.
12. To sprout.
13. Prolonged period (years) without rain.
14. A natural force of change in the savannah.
15. Eaters of leaves, twigs, stems, branches, etc.
18. Eaters of grasses.
20. Grazable and browsable plants, together.

# SAVANNAH VOCABULARY REVIEW

## Answer Key


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
NOMADIC
TERMITES
ENZYMES
PROTOZOAN
PREY
SCAVENGER
RESIDENT
MALARIA
LOCUST
HERBIVORE
MIGRATE
NICHE
MOSQUITO
DIVERSITY
CELLULOSE
TSETSE
SAVANNA
CARRION
PREDATOR
GERMINATE
DROUGHT
FIRE
BROWSERS
GRAZER
FORAGE

### ACROSS

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5. Underground fungus farmers.
7. Chemicals that help break down food.
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# AFRICAN SAVANNAH CLIMATE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will know the average temperature and amount of rainfall on the African Savannah.

Social Studies CCG's: 3.5, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1.

### VOCABULARY:

- climate
- average rainfall

### MATERIALS:

- Copies of the African Savannah Climate Graph.
- Copies of the student directions for African Savannah Climate.

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Explain the African Savannah Climate Graph to the students (temperature on left, rainfall on the right, months of the year at the bottom).
- Have students answer the questions about the graph individually or in groups.
- Discuss the answers and the difference between the climate of the savannah and the climate in Oregon.

### OPTION:

- Give students information and have them create their own graphs and record the information.

### ENRICHMENT:

- Have students make graphs of the average temperature and rainfall of Oregon.

# AFRICAN SAVANNAH CLIMATE

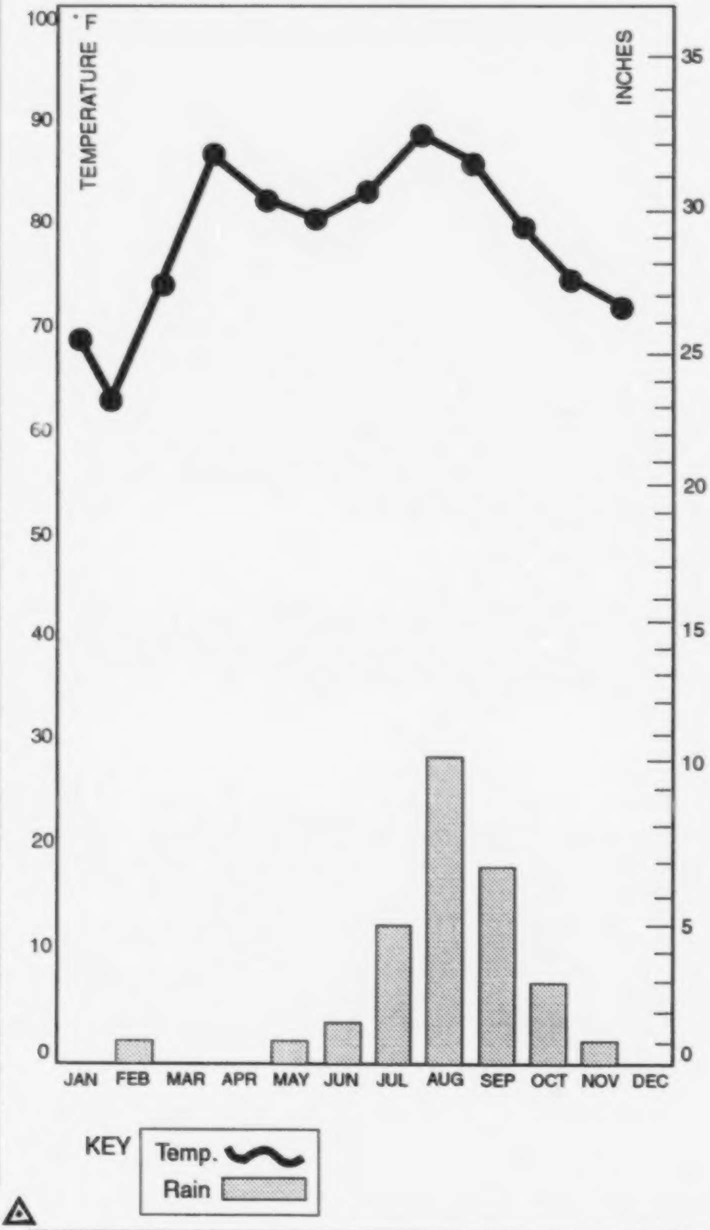
## Temperature and Rainfall Chart

| | Temperature (°F) | Rainfall (inches) |
|---|---|---|
| **January** | 70° | No Rain |
| **February** | 65° | 1" |
| **March** | 75° | No Rain |
| **April** | 85° | No Rain |
| **May** | 80° | 1" |
| **June** | 83° | 2" |
| **July** | 86° | 5" |
| **August** | 89° | 11" |
| **September** | 80° | 7" |
| **October** | 74° | 3" |
| **November** | 70° | 1" |
| **December** | 68° | No Rain |

# TROPICAL SAVANNAH CLIMATE

## Temperature and Rainfall Graph

Answer each question using the Savannah Temperature and Rainfall Chart.



**1.** What month gets the most rainfall on the savanah?________________

**2.** What month gets the least rainfall on the savannah?______________

**3.** What month is the hottest on the savannah?________________

**4.** What month is the coolest?

____________________________

**5.** What is the greatest monthly amount of rainfall (in inches) on the savannah?

____________________________

**6.** What is the least amount of rainfall (in inches) on the savannah?________

**7.** What is the highest temperature reached on the savannah?_________

**8.** What is the lowest temperature reached on the savannah?_________

**9.** How is the climate on the savannah different from the climate in Oregon?

____________________________

# AFRICAN SAVANNAH CLIMATE

## Answer Key

Answer each question using the Savannah Temperature and Rainfall Chart.

1. What month gets the most rainfall on the savannah?
   *August*

2. What month gets the least rainfall on the savannah?
   *January, March, April, December*

3. What month is the hottest on the savannah?
   *August*

4. What month is the coolest?
   *February*

5. What is the greatest monthly amount of rainfall (in inches) on the savannah?
   *11 inches*

6. What is the least monthly amount of rainfall (in inches) on the savannah?
   *no rain*

7. What is the highest monthly temperature reached on the savannah?
   *89 degrees*

8. What is the lowest monthly temperature reached on the savannah?
   *65 degrees*

9. How is the climate on the savannah different from the climate in Oregon?
   *answers may vary, use information provided in almanacs, newspapers, etc.*

# IMPALAS

## ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- identify and describe food, water, and shelter as three essential components of habitat
- describe the importance of good habitat for animals
- define "limiting factors" and give examples
- recognize that some fluctuations in wildlife populations are natural as ecological systems undergo a constant change

CONCEPTS: 1.1-1.3, 1.5-1.7, 1.10, 1.11, 1.13, 1.14
PROCESSES: 2.2, 2.3, 2.5, 2.12, 2.13, 2.15

## VOCABULARY:

- balance of nature
- ecosystem, habitat
- limiting factors
- predator
- prey
- population

## MATERIALS:

area—either indoors or outdoors—large enough for students to run; e.g., playing field; chalkboard or flip chart; writing materials.

## ACTIVITY DIRECTIONS:

**1.** Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components—food, water, and shelter—but the students should not forget the importance of the animals having sufficient space in which to live, and that all the components have to be in a suitable arrangement or the animals will die.

**2.** Ask your students to count off in fours. Have all the ones go to one area; all twos, threes and fours go together to another area. Mark two parallel lines on the ground or floor ten to twenty yards apart. Have the ones line up behind one line; the rest of the students line up behind the other line.

**3.** The ones become impalas. All impalas need good habitat in order to survive. Ask the students what the essential components of habitat are again: **food, water, shelter,** and **space in a suitable arrangement.** For the purposes of this activity, we will assume that the impalas have enough space in which to live. We are emphasizing food, water, and shelter. The impalas (the ones) need to find food, water, and shelter in order to survive. When an impala is looking for **food,** it should clamp its hands over its stomach. When it is looking for **water,** it puts its hands over its mouth. When it is looking for **shelter,** it holds its hands together over its head. An impala can choose to look for any one of its needs during each round or segment of the activity; **the impala cannot, however, change what it is looking for;** e.g., when it sees what is available, **during that round. It can change again what it is looking for in the next round, if it survives.**

**4.** The twos, threes and fours are food, water, and shelter—components of habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round. The students depict which component they are in the same way the impalas show what they are looking for; that is, hands on stomach for food, etc.

**5.** The game starts with all players lined up on their respective lines (impalas on one side; habitat components on the other side)—and **with their backs to the students at the other line.**

**6.** The facilitator or teacher begins the first round by asking all of the students to make their signs—each impala deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to get their hands in place—over stomachs, mouths, or over their heads. (As you look at the two lines of students, you will normally see a lot of variety—with some students water, some food, some shelter. As the game proceeds, sometimes the students confer with each other and all make the same sign. That's okay, although don't encourage it. For example, all the students in habitat might decide to be shelter. That could represent a drought year with no available food or water.)

**7.** When you can see that the students are ready, count: "One. . . two. . . three." At the count of three, each impala and each habitat component turn to face the opposite group, continuing to hold their signs clearly.

**8.** When impalas see the habitat component they need, they are to run to it. Each impala must hold the sign of what it is looking for until getting to the habitat component person with the same sign. Each impala that reaches its necessary habitat component takes the "food," "water," or "shelter" back to the impala side of the line. This is to represent the impala successfully meeting its needs, and successfully reproducing as a result. Any impala that fails to find its food, water or shelter dies and becomes part of the habitat. That is, in the next round, the impala that died is a habitat component and so is available as food, water, or shelter to the impalas who are still alive.

NOTE: When more than one impala reaches a habitat component, the student who gets there first survives. Habitat components stay in place on their line until an impala needs them. If no impala needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat person can, however, change which component it is from round to round.

**9.** You as the facilitator or teacher keep track of how many impalas there are at the beginning of the game, and at the end of each round you record the number of impalas also. Continue the game for approximately 15 rounds. Keep the pace brisk, and the students will thoroughly enjoy it.

**10.** At the end of the 15 rounds, gather the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of impalas (seven students in a class size of 28) begin by finding more than enough of its habitat needs. The population of impalas expanded over two to three rounds of the game, until the habitat was depleted and there was not sufficient food, water, and shelter for all the members of the herd. At that point, impalas starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

**11.** Using a flip chart pad or an available chalkboard, post the data recorded during the game. The number of impalas at the beginning of the game and at the end of each round represent the number of impalas in a series of years. That is, the beginning of the game is year one; each round is an additional year. Impalas can be posted by fives for convenience.

The students will see this visual reminder of what they experienced during the game: the impala population fluctuated over a period of years. This is a natural process, as long as the factors which limit the population do not become excessive, to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, decline, and rebuild, peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to successfully reproduce.

**12.** In discussion, ask the students to summarize some of the things they have learned from this activity. What do animals need to survive? What are some of the "limiting factors" that affect their survival? Are wildlife populations static, or do they tend to fluctuate, as part of an overall "balance of nature? Is nature ever really in "balance" or are ecological systems involved in a process of constant change?

## BACKGROUND:

A variety of factors affects the ability of wildlife to successfully reproduce and to maintain their populations over time. Disease, predator/prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution and habitat destruction and degradation are among these factors.

Some naturally-caused as well as culturally induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals.

The most fundamental of life's necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animals cannot survive.

This activity is designed for students to learn that:
**A)** good habitat is the key to wildlife survival;
**B)** a population will continue to increase in size until some limiting factors are imposed;
**C)** limiting factors contribute to fluctuations in wildlife populations; and
**D)** nature is never in "balance," but is constantly changing.

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors. We tend to speak of limiting factors as applying to a single species, although one factor may affect many species. Natural limiting factors, or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of "balance in nature" is not static, but is more like a teeter-totter than a balance. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring; grow to a population of 1,200 birds by late spring; and decline slowly to a winter population of 100 pairs again. This cycle appears to be almost totally controlled by the habitat components of food, water, shelter, and space, which are also limiting factors. Habitat components are the most fundamental and thereby the most critical of limiting factors in most natural settings.

This activity is intended to be a simple but powerful way for students to grasp some basic concepts: that everything in natural systems is interrelated; that populations of organisms are continuously affected by elements of their environment; and that populations of animals do not stay at the same static number year after year in their environment, but rather are continually changing in a process of maintaining dynamic equilibria in natural systems. The major purpose of this activity is for students to understand the importance of suitable habitat as well as factors that may affect wildlife populations in constantly changing ecosystems.

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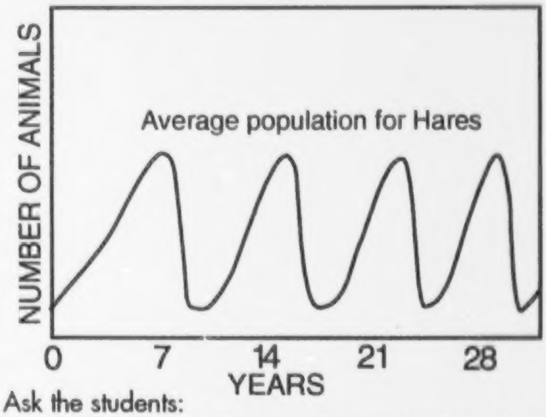
## ENRICHMENT:

**1.** When you have finished tabulating the graph data and discussing it, ask the students if they have ever heard of the Hudson Bay trappers in American history. Tell them, briefly, who they were.

There is a hundred years, or more, of records of the activities of these trappers. In those records are some interesting data. These data refer to pelts shipped from America to Europe, particularly the pelts of snowshoe hares and lynx. Researchers have found that snowshoe hare populations seem to peak about every seven to nine years and then crash, repeating the process over each comparable time period. So, a snowshoe hare population graph would look like this:

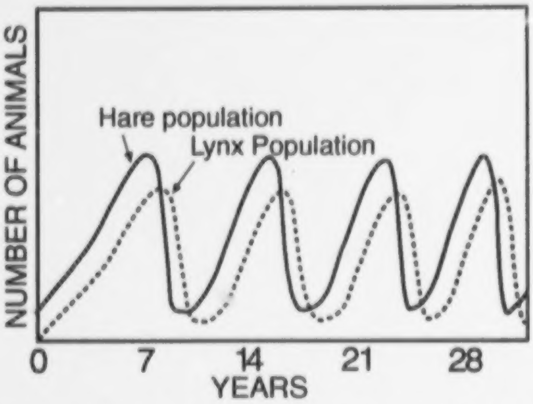


Ask the students:

- Which animal is the predator? Which prey?
- Are predators controlling the prey, or are prey controlling the predators? (We have been brought up to "know" that predators control the prey—and are now discovering that this is not so. The number of prey animals available tells us how many predators can live in the area.)
- Is this like the impala habitat game we just played? Who controls? (Sometimes the habitat—when the impala population is not too large; sometimes the habitat—when the impala population "gets on top of it" and destroys the vegetative food and cover.)

**2.** Some recent research has added a new dimension to the story of the snowshoe hares and the lynx.

It has also been discovered that lynx populations do the same thing—except that they do it one year behind the hare populations. The combined graph would look like this:



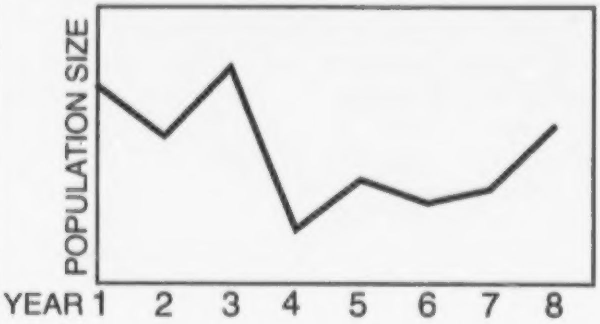
It has been found that a major winter food of the hare is a small willow. As hare populations grow, the use of the willow plants grows too. But, when the willow plant has been "hedged" or eaten back so far, the plant generates a toxin (poison) which precludes use by the hare. That is when the hare population crashes, followed by the crash of the lynx population about a year later. Then the willow, relieved of pressure, begins to grow again. The hare population begins to grow in response, and last of all, within a year or so, the lynx population follows. And the cycle has begun again—over and over—every seven to nine years.

**3.** Discuss the "balance of nature." Is it ever in "balance?"

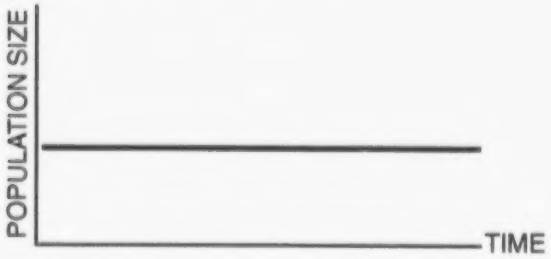
## EVALUATION:

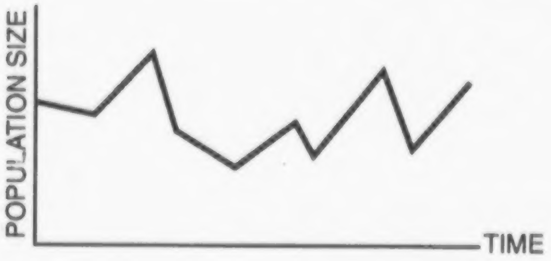
- Name three essential components of habitat.
- Define "limiting factors." Give three examples.
- Examine the graph. What factors may have caused the following population changes:

A. between years 1 and 2?
B. between years 3 and 4?
C. between years 5 and 6?
D. between years 7 and 8?



Which of the following graphs represents the more typically balanced population?





3. Introduce a new limiting factor into the game, such as disease, injury, hunting, pollution or habitat loss. Designate a "disease student" to stand at mid-field and attempt to touch impala as they run. Once touched, an impala dies and joins the habitat students in the next round. Hunting can be simulated in the same way. When an "injury student" touches an impala, it may continue to compete hopping on one foot. Simply remove several habitat students before each running to simulate pollution or habitat loss.

It is best to choose only one of these new limiting factors and play the game, recording population data again for 15 rounds. Then you may fairly attribute "new population trends" to the single new limiting factor, having controlled other variables. Discuss this concept with your students. Also discuss how people might manage an impala population to compensate for human-introduced limiting factors such as hunting, pollution and habitat loss.

# TRADITIONAL SAVANNAH HOUSING

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to recognize the types of houses constructed in the African Savannah Region and will understand why this type of house is built and with what material.

Social Studies CCG's: 5.1, 5.3, 5.4, 5.6, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3, 7.4, 8.1.

### MATERIALS:

- paper towel cardboard tube, cut in 2 1/2 inch sections.

- 1 piece of thick cardboard for each student/group of students for base of village or single house.
- dried grass or hay for roof of house.
- pieces of stick or toothpicks for roof support.
- felt pens for making wall designs.
- copies of the student directions for making Traditional Savannah Housing.
- (optional) Copies of the Traditional Savannah Housing information.

### ACTIVITY DIRECTIONS:

- Discuss with students the various traditional house types of the savannah.
- Have students examine drawings of various houses.
- Ask students-
  - Why is grass and mud the main building material?
  - What does the climate of the region have to do with this type of house being built?
  - Why aren't houses built this way in Oregon?
- (optional) Give students copies of the Traditional Savannah Housing information and continue discussion about housing of the savannah.
- Divide students into groups to make villages.
- Distribute student directions for making Traditional Savannah Housing.

### ENRICHMENT:

- Create replicas of other types of housing in Africa's Savannah or Rainforest.

# TRADITIONAL SAVANNAH HOUSING

## Information

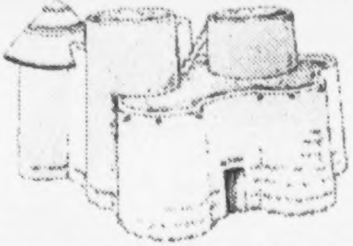
Traditional African Houses consist of one-room buildings with several buildings making up a homestead. (In contrast, here in the United States we build homes with several rooms all under one roof.) These single-room buildings are then surrounded by a fence or wall. Each building has a specific purpose such as a kitchen, bedroom, storage, etc. The buildings all look alike with most being the same size (except for the granary or cattle house which would be the largest building in the compound).

The buildings are always built of vegetable materials which grow in the area because they are always available when they need to be replaced. This causes very little damage to the environment.

The homesteads are not of a permanent nature and are often rebuilt with every generation, reflecting changed social groupings. Unlike the United States, wealth is not shown through the size and opulence of the houses.

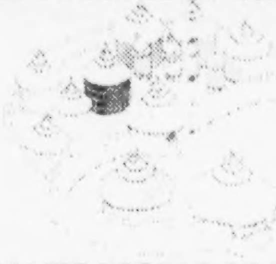
There are many shapes of houses throughout Africa and many different building materials used. Following are some examples of the more common types of houses built in the African Savannah Region.

### THE SOMOLO PEOPLE OF SOUTHERN BURKINA FASO



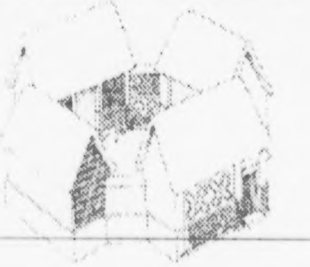
The Somolo people build multi-story houses of mud with roofs of palm fronds. There is a courtyard in the center of each house. Houses sometimes consist of as many as twenty rooms, one for each wife, as well as a kitchen, storage, children's rooms, etc.

### THE NUPE PEOPLE OF CENTRAL NIGERIA



The Nupe construct mud buildings within mud walls, with a building serving as an entrance room. Inside the walls are buildings for each wife, unmarried daughters, unmarried sons, stable, kitchen, storage, etc.

### THE ASANTE PEOPLE OF SOUTHERN GHANA



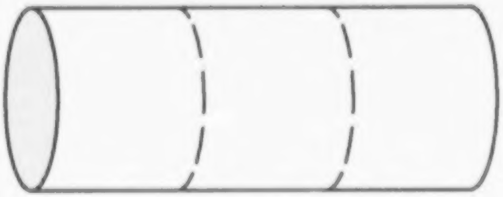
The Asante houses are built around one or more courtyards and around each are four rooms joined at their corners with a short wall. Mud is used for the walls, built on wooden frames. The walls of the houses are beautifully decorated.

# TRADITIONAL SAVANNAH HOUSING

## Directions

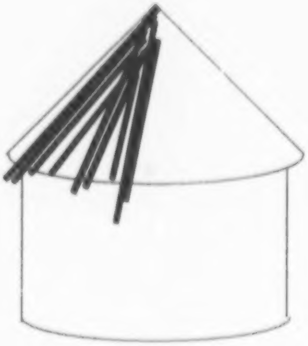
After studying traditional savannah housing, individually or in groups, make a replica of one of the houses. When finished, make a village with a group of students.

**STEP 1**
Use a piece of heavy cardboard as the base of the house or village. This can be colored, covered, or painted to resemble ground-cover.



**STEP 2**
Using a paper towel or other tube, cut into 2 1/2" sections, decorate sides with felt pens and glue to the base, creating the walls of a house.

**STEP 3**
With brown construction paper, form a cone "roof" to fit on the top of the tube. Glue to tube with some overlap.



**STEP 4**
Glue dried grass or hay onto the "roof" of the starting at the point of the cone down to the edge of the cone.

**STEP 5**
Allow all parts to dry well.

Several houses can be made in this manner until a village is formed.

# BUILDING A BIOME

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will make model biomes of the desert, grassland, deciduous forest and rain forest and see how well different plants grow in each. Students will observe how light, temperature and humidity play a role in the formation of various biomes and the effect of these on plant life.

### VOCABULARY:

- biome

Concepts: 1.1-1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

### MATERIALS (PER GROUP):

- 1 2 liter cardboard milk carton
- Scissors
- Sandy soil or potting soil
- Lamp or light source
- Seeds:
  5 lima beans, 30 rye grass,
  10 impatiens
- Index card
- Clear plastic wrap
- Tape
- Timer

### ACTIVITY DIRECTIONS:

- Use this laboratory as a before or after zoo visit activity.
- Have students work in groups of 2-4 and assign each person in the group a job or role.
- Have students complete the 'Observations and Conclusions' and have each group share their findings with other groups so that they can see how other biomes respond to their 'environment'.
- You can also take this activity a step further and take temperature readings for each biome and record them on a daily basis.

### ENRICHMENT:

- This same lab can be done with seeds of plants that are found in your local area.
- Discuss the various types of biomes in the Pacific Northwest and set up simulations of those environments.

# BUILDING A BIOME

## ACTIVITY OBJECTIVE:

In this activity, you will make model biomes and see how well different plants grow in each biome.

## MATERIALS (PER GROUP):

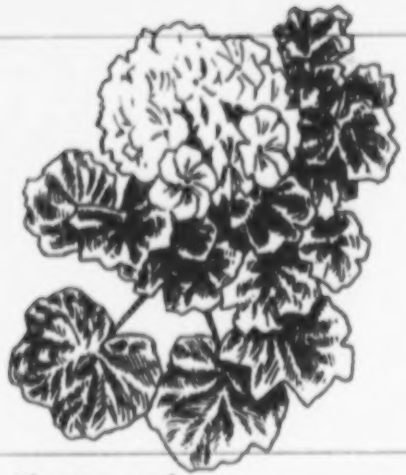
- 1 2-liter cardboard milk carton
- Scissors
- Sandy soil or potting soil
- Lamp or light source
- Seeds: 5 lima beans, 30 rye grass, 10 impatiens
- Index card
- Clear plastic wrap
- Tape
- Timer

## PROCEDURE:

1. Your teacher will assign your group one of the following biomes:
   desert, grassland, rain forest, or deciduous forest.
2. Cut the entire front wall from a milk carton. Staple the spout closed.
   **CAUTION:** Be careful in handling the scissors.
3. Fill the carton with soil within 3 cm of the top. Note: If you have been assigned the desert biome, use sandy soil.
4. At one end of the carton, plant impatiens seeds. In the middle of the carton, plant beans 3 cm deep. Scatter rye at the other end of the carton.
5. On your index card, write the names of your group, the seeds, and the type of biome. Tape the index card to the side of the carton.
6. Water the seeds well. Cover the open part of the carton with plastic wrap.
7. Put the carton in a warm place where it will remain undisturbed. Observe the carton every day and record any and all changes that you observe.
8. After the seeds have sprouted, and depending upon which biome your group has, give it the following amounts of light and water.
   - Desert: little water, 5-6 hrs. light
   - Grassland: medium water, 5-6 hrs light
   - Deciduous forest: medium water, 1-2 hrs light
   - Rain forest: much water, no direct light

   "Much water": Keep soil surface wet.
   "Medium water": Let surface dry, then add water.
   "Little water": Let soil dry to a depth of 2.5 cm.
9. Observe the biomes of the other groups.

## OBSERVATIONS AND CONCLUSIONS:



1. After the seeds have sprouted and have grown for a week, describe the growth in each biome. Enter your observations in the Data Table pro-vided. (If your teacher asks, take a temperature reading every day and record the temperature for each biome).

### DATA TABLE

| Biome | Plant growth |
|---|---|
| **Dessert** | |
| **Grassland** | |
| **Deciduous forest** | |
| **Rain forest** | |

**2.** In which biome did most of the seeds grow best?

**3.** In which biome did the grass seeds grow best? The beans? The impatiens? Explain your results.

**4.** Which plants grew well in more than one biome?

**5.** How do beans react to little light?

**6.** Why did the seeds need water when they were planted?

# OBSERVING A RAINFOREST STORM!

## ACTIVITY OBJECTIVES:

1. To observe and make note of changes in the tropical environment during a storm.
2. To observe animal behavior during environmental change.

Concepts: 1.1-1.3, 1.5, 1.7, 1.8, 1.11, 1.12, 1.14
Processes: 2.6, 2.15

## MATERIALS:

If you would like students to take notes, they will need note taking materials.

## TEACHING SUGGESTIONS:

- This activity is designed as an on-site zoo exercise.
- This activity is designed to get students to use all of their senses and observe the variety of changes that occur in an environment. It is up to each individual teacher to decide whether to have students take notes during this activity or to have students just observe the changes and make mental notes for later discussion.
- This activity takes place in the Africa rain forest 'storm room' just beyond the Kongo Ranger Station.
- The 'tropical storm' occurs "every 30 minutes on the hour and half hour and lasts for three minutes." It is suggested that you arrive at the exhibit approximately 10 minutes before the storm starts so that students can become familiar with the exhibit and the variety of life that is present.
- If you have chosen to have students take notes, you may want them to work in groups or individually and make observations about the environment before the storm occurs.
- Observations made before, during and after the storm should take into account the following things:
  - A. animal behavior
  - B. climate conditions (temperature, humidity, air movements,etc.)
  - C. sounds
  - D. light
  - E. changes in land (erosion)

## ACTIVITY DIRECTIONS:

In the African rain forest exhibit, a tropical 'storm' occurs "every 30 minutes on the hour and half hour and lasts for three minutes." During this storm, many changes occur and it is your job to watch what those changes are.

1. When you enter the exhibit (before the storm), look around you and observe the environment. What do you see? What kinds of animals do you see and what are those animals doing right now?
2. What does the air feel like in this environment? What is the temperature? Is it humid? Is it windy or is the air still?
3. As the storm begins, notice ANY changes that occur. Watch the animals that you noticed when you first entered the exhibit. Is their behavior any different than it was? Are they moving more or less? Have they gone for shelter? Some animals may not make any quick changes but may move only slightly during the storm.
4. What are the changes in sounds and light? With the heavy rainfall that occurs, do you see any evidence of erosion? During the storm, are there any changes in temperature, humidity or the wind?
5. At a later time, discuss as a class your experience of the rain forest storm. Use the above questions as part of your discussion.

# AFRICAN HABITAT MODELS

## ACTIVITY OBJECTIVES:

Students will demonstrate ..
- understanding of savannah and tropical rainforest habitats and microhabitats of Africa
- knowledge of the diverse animal life therein
- ability to create scale models with relative accuracy

Concepts: 1.3, 1.5-1.8, 1.11, 1.12, 1.14, 1.19, 1.23
Processes: 2.1, 2.2, 2.6, 2.14, 2.15

## VOCABULARY:

- canopy
- emergent
- forest floor
- grassland
- microhabitat
- rainforest
- savannah
- scale model
- swamp
- topography
- tropical
- understory
- woodland

## MATERIALS:

Plywood sheet or other rigid backing, approximately 4 square feet; papier maché supplies; water colors and paint supplies; modeling clay; plant parts (described at right); scissors; glue; toothpicks; paper; pens and pencils; illustrated references on animals of Africa's savannah and tropical rainforests.

## ACTIVITY DIRECTIONS:

1. Organize your students into teams of two or three, and allow each team to choose which habitat they wish to represent, tropical rainforest or savannah.

2. Explain to your students that they will use materials to create scale models of habitats. Each will include varying topography and microhabitats (rainforest layers; in savannah, the woodlands, grasslands, swamps, etc) and a variety of animals depicted in these microhabitats. Review and discuss rainforest layers, savannah microhabitats and other vocabulary.

3. TOPOGRAPHY:
Students can use papier maché to create ups, downs, slope variation, waterholes, whatever is needed. Avoid extreme slope, as it's tough to work with. When finished and dry, have students use water colors to depict rock, soil, mud, water, grassy foliage.

4. VEGETATION:
Trees and shrubs are best simulated by real plant parts with many compound leaflets or myriad branching (ferns, hydrangea flowers, upright fibrous roots) because they look realistic in miniature, and are easily shaped with scissors. Have students scavenge for good material for this. Anchor trees with modeling clay, which may be shaped to depict buttress or stilt roots if desired.

### 5. MICROHABITATS:

Savannah models should include water, grassland and woodland. Rainforest models should be recognizably layered in forest floor, understory, canopy and emergent zones. Animals should be depicted in microhabitats in which they spend most of their time, although this varies greatly in the savannah. Since the canopy is dense and nearly impenetrable, students will need to show their animals by creating breaks in the canopy through which one can see below, through all of the layers (holes recently created by the death of emergents or large canopy trees).

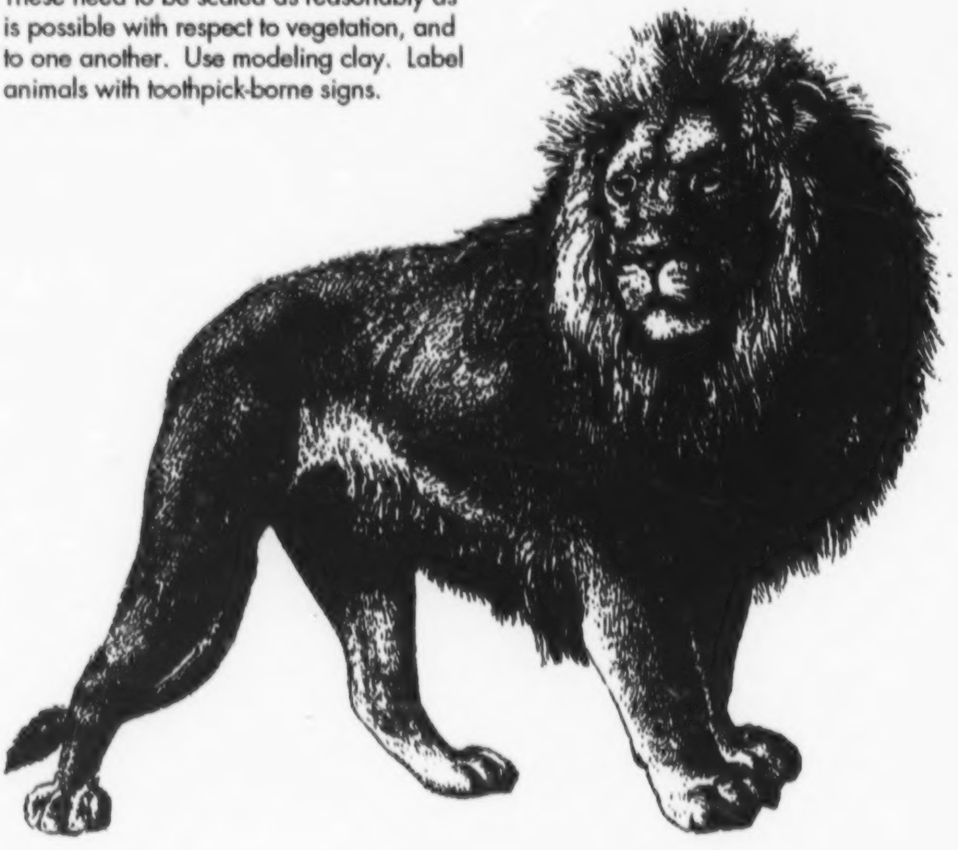
### 6. ANIMALS:

These need to be scaled as reasonably as is possible with respect to vegetation, and to one another. Use modeling clay. Label animals with toothpick-borne signs.

### ENRICHMENT:

This activity may be individualized if desired. It may also be collectivized, as a whole-class, long-term project covering 100 or more square feet. This can be done by creating an overall design and delegating sub-divided portions of the model to student teams.

For comparison, have students research an Oregon habitat, such as coastal forest, rocky intertidal zone, high plateau pine forest, desert, etc. and construct models as above.



# A DIVERSE CAST OF PLAYERS

## GRADES 6-8

A DIVERSE CAST OF PLAYERS gives students an opportunity to learn more about the animals and people of the African rainforests and savannah regions. Science skills of observation and classification are emphasized. Students also get a glimpse of the culture of the people by learning about folktales and folk art forms of Africa.

The activities from this section are described below:

### PEOPLE OF AFRICA DATA BASE*

- Students learn basic facts about the people of Africa.

### A CONTINENT OF CHANGE

- Students compare and contrast political and economic relationships between the old and the new in Africa.

### AFRICAN FOLKTALES*

- Students learn about the people of Africa and their culture by reading African folktales.

### AFRICAN MASKS*

- Students make masks like those found in Africa.

### FOLK ART OF AFRICA

- Students use wax and dye to make banners of African designs.

It is recommended to look at the activities in the 3rd-5th Grade Level for other activities to adapt for these levels.

# PEOPLE OF AFRICA

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will learn about African groups of people, the countries in which they live, and other pertinent information.

Social Studies CCG's: 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 4.2, 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 8.1.

### VOCABULARY:

See list of people on activity sheet for vocabulary

### MATERIALS:

- Copies of the outline map of Africa.
- Copies of the student directions for People of Africa.

### ACTIVITY DIRECTIONS:

- Have students work individually or in groups to learn about the African groups of the Savannah and Rainforests.
- Have individuals or groups sort the groups of people under the labels of ***Savannah*** and ***Rainforest*.**
- Locate the groups of people on an outline map of Africa.

### ENRICHMENT:

- Have students select one group of people to study indepth.

180

# PEOPLE OF AFRICA

## Information Sheet

**Ga-**
people of southern Burkina Faso

**Ashanti-**
people of Ghana, weavers

**Baule-**
neighbor to the Ashanti in West Africa

**Dogan-**
farmers of Mali

**Ewe-**
drum people of Benin

**Fanti-**
people of the Ivory Coast/Togo region

**Vai-**
people of Liberia

**Yoruba-**
great artists of Nigeria

**Uge Housa-**
northern neighbors of the Yoruba

**Ndaka-**
people of the Cameroon

**Wagenia-**
fisherman of the Congo region

**Kung-**
short wiry people of Angola

**Quimbande-**
living in southern Zaire, the men of the Quimbande group have as many wives as they can afford

**Lozi-**
they live by the Zambezi River in Zimbabwe

**Ikoma-**
people of southern Tanzania, they are honey gatherers

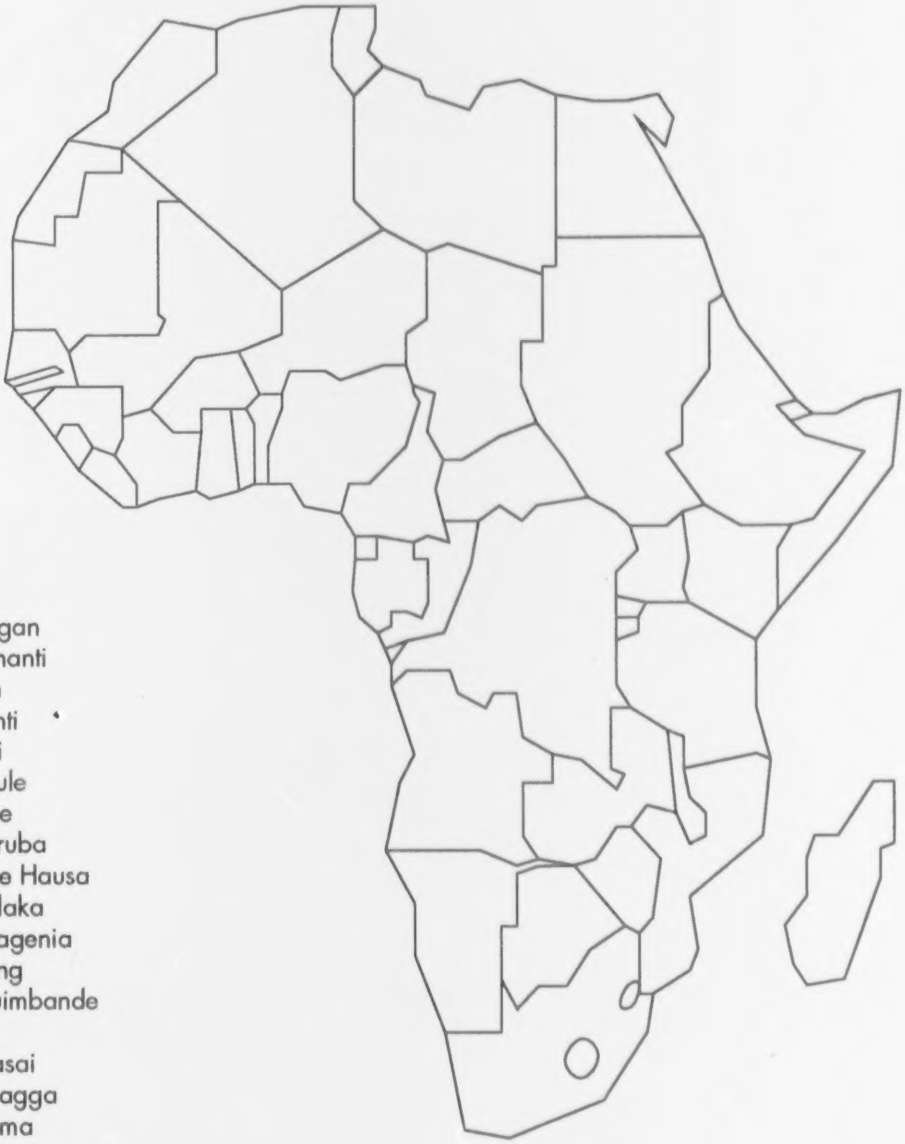
**Chagga-**
neighbors of the Ikoma, the Chagga live in central Tanzania

**Masai-**
people of northern Tanzania, they are tall, proud dwellers of the savannah

**Jie-**
great herders of Uganda, their cattle are their pride and joy and a sign of wealth

# PEOPLE OF AFRICA

Locate and label the following African groups of the Savannah and Rainforest on a map of Africa:

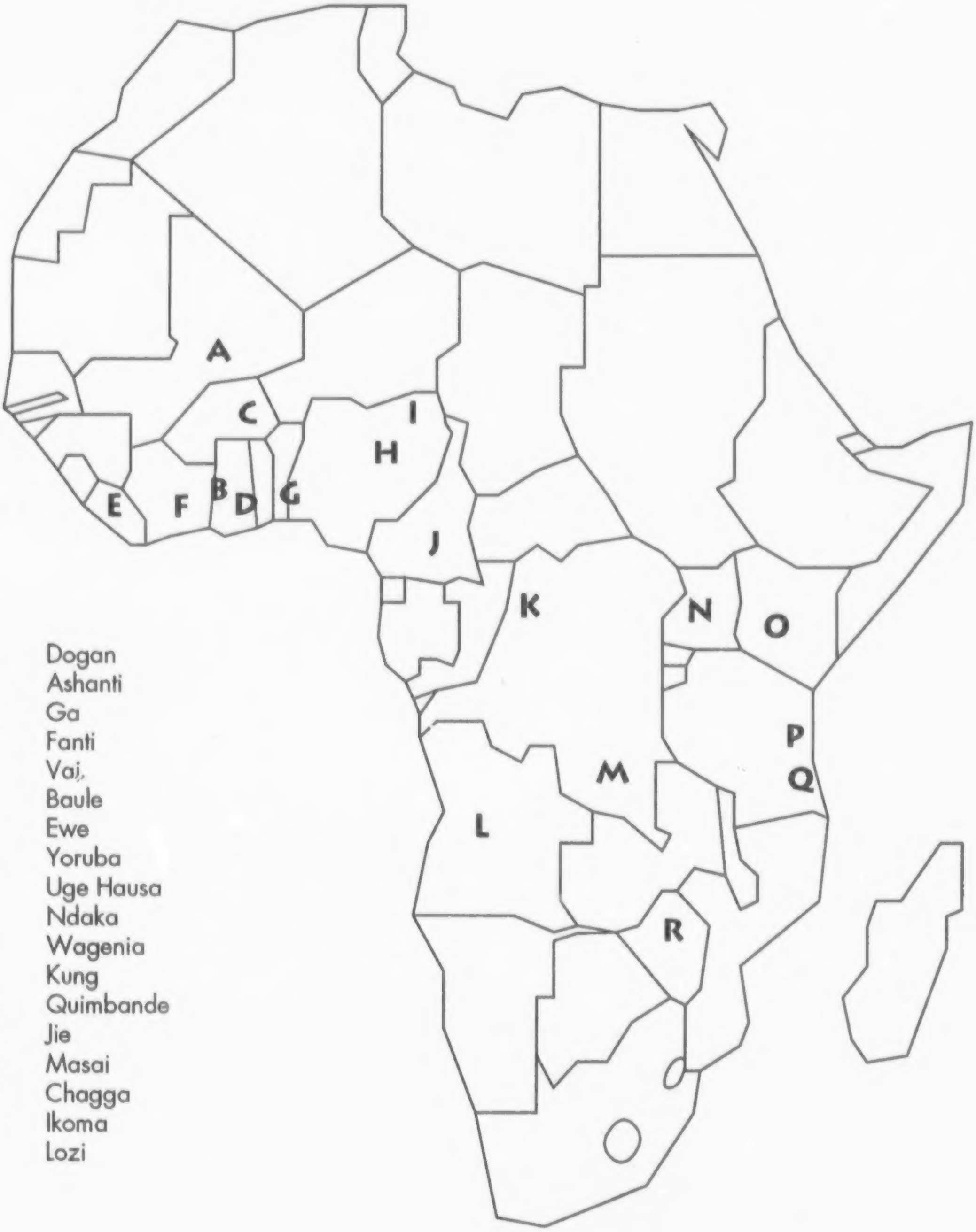


**A.** Dogan
**B.** Ashanti
**C.** Ga
**D.** Fanti
**E.** Vai
**F.** Baule
**G.** Ewe
**H.** Yoruba
**I.** Uge Hausa
**J.** Ndaka
**K.** Wagenia
**L.** Kung
**M.** Quimbande
**N.** Jie
**O.** Masai
**P.** Chagga
**Q.** Ikoma
**R.** Lozi

182

# PEOPLE OF AFRICA

## Answer Key



**A.** Dogan
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**P.** Chagga
**Q.** Ikoma
**R.** Lozi

# A CONTINENT OF CHANGE: YESTERDAY AND TODAY

**Teacher**

**Information**

## ACTIVITY OBJECTIVE:

Students will be able to compare and contrast political and economic relationships between the old and the new in Africa.

Social Studies CCG's: 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 4.2, 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 8.1.

## VOCABULARY:

- nationalism
- subsistence
- pastoral
- barter
- industrialization
- capital accumulation
- monarches

## MATERIALS:

- Copies of the student activity for A Continent of Change: Yesterday and Today.

## ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have individuals or groups discuss the traditional or old political and economic information and fill in the new form of political and economic chart.
- (optional) Provide students with the information to complete this chart in a lecture and have students complete the chart together.
- Have students share their answers and correct.

## ENRICHMENT:

- Explore indepth one of the traditional or new political or economic relationships listed on the chart.

184

# A CONTINENT OF CHANGE: YESTERDAY AND TODAY

| TRADITIONAL | NEW |
|---|---|
| Extended family, kinship group, ethnic group or people | |
| Traditional religion and rituals, traditional education and medicine, Islam | |
| Subsistence, traditional economies, both pastoral and agriculture | |
| Local trade and barter, little money | |
| **VILLAGES** | |
| Traditional government by monarches and by councils of elders | |

# A CONTINENT OF CHANGE: YESTERDAY AND TODAY

## Answer Key

| TRADITIONAL | NEW |
|---|---|
| Extended family, kinship group, ethnic group or people | Nationalism and Nation-States political parties, labor unions, smaller families |
| Traditional religion and rituals, traditional education and medicine, Islam | Modern science and modern medicine, western style education, Christianity |
| Subsistence, traditional economies, both pastoral and agriculture | Market agriculture, advanced technology, industrialization, capital accumulation, and economic growth |
| Local trade and barter, little money | Money economy, growth of trade, including international trade |

| VILLAGES | CITIES |
|---|---|
| Traditional government by monarches and by councils of elders | Nation - States, written constitutions, elections, popular leaders |

# AFRICAN FOLKTALES

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be learn about the people of Africa and their culture by reading African folktales.

Social Studies CCG's: 5.1, 5.2, 5.6, 6.1, 6.4, 7.3, 7.4, 8.1.

### VOCABULARY:

- folktale
- moral of a story

### MATERIALS:

- Copies of African folktales from school library or other resources such as:

African Folktales, Paul Radin, Editor, Schoken Books, New York, 1983.
Anansi and the Moss-Covered Rock, Eric Kimmel, Holiday House, New York, 1988.
**see Resources Section for additional folktales**

### ACTIVITY DIRECTIONS:

- Teach activity vocabulary.
- Have individuals or groups read African folktales and discuss their meaning.
- Have students think of similar folktales from other cultures.

### ENRICHMENT:

- Talk to parents and friends to try to learn more folktales and their meanings. Share the folktales with classmates.
- Write original folktales to tell why things are the way they are now.

# AFRICAN MASKS

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will be able to use their creativity and imagination to create African masks.

Social Studies CCG's: 5.1, 5.2, 5.6, 6.1, 6.4, 7.3, 7.4, 8.1.

### VOCABULARY:

- papier-mache'
- paste
- saturated

### MATERIALS:

- bowls/buckets
- paper (news)
- balloons
- flour
- water
- window screening
- chicken wire
- boards
- paint
- shellack (if allowed)

### ACTIVITY DIRECTIONS:

- Look at pictures of African masks (or actual masks if available).
- Draw a mask on paper before you begin the actual project, making changes as needed.
- Cut newspaper into 1" strips and set aside.
- Make a mask mold using the balloon or board and chicken wire.
- Make a paste by mixing equal parts of flour and water (the paste should be fairly thick); stir frequently.
- In a bowl of water, lightly soak the newspaper strips and transfer the strips into the paste until they are soft and sticky.
- Place the saturated newspaper strips onto the mold or balloon, overlapping them. Several layers should be used to build it up and shape the mask.
- Before the strips dry, mold the mask into the desired shape, trim the edges and cut - out the eyeholes or another desired holes.
- After the mask has dried (usually 24 hours) it is ready to be painted. Allow the paint to dry before removing from the mold or popping the balloon.
- Paint the masks and if allowed, shellac the mask both inside and out.

### ENRICHMENT:

The masks can also be done in clay.

# GET A LIFE!

# GRADES 6-8

GET A LIFE! helps students understand how animals live in and adapt to their environment. This section includes information about the natural resources that are found in Africa. Students begin to understand the inter-relationship of Africa and the United States by analyzing their use of products from Africa.

Select the appropriate activities for use in your class from the descriptions below:

**ALL THAT ROT***
- Students design experiments that help them identify agents or conditions that hasten decomposition of organic matter.

**THERE'S A HOLE IN THE CANOPY***
- Students learn about photosynthesis, phototropism, and plant competition for light in a rainforest.

**THE BUILDING OF A PYRAMID***
- Students learn the basic concept of an ecosystem.

**MAMMALS OF THE SAVANNAH***
- Students learn about various mammals of the African savannah and how they are able to adapt to their environment.

**IT'S ALL IN THE BILL***
- Students use observation skills to study the variety of bird life that can be found in the African savannah and rainforest.

**IN THE CARDS***
- Students study a variety of African savannah and tropical rainforest wildlife in order to classify these animals by their feeding habits or by phyla.

**MADE IN THE JUNGLE ***
- Students learn about products from the rainforest and how they use them in their homes.

**TROPICAL SAVANNAH ECONOMY**
- Students participate in a simulation game by identifing five major cash crops and five raw materials, and study the problems of being dependent on a single crop or resource.

*Other activities can be adapted from those starred activities that are included in the 3rd-5th Grade Level.

# ALL THAT ROT

## Teacher Information

### OBJECTIVES:

Students will demonstrate the ability to

- design and implement an experiment
- record observations.
- identify agents or conditions that hasten decomposition of organic matter, as discovered in the experiment.

CONCEPTS: 1.1-1.4, 1.11-1.14
PROCESSES: 2.1-2.5, 2.10, 2.13, 2.15

### VOCABULARY:

- decomposition
- nutrients
- organic matter

### MATERIALS:

(for each student) an orange; plastic quart container with lid; balance with gram counterweights; journals and pencils.

### BACKGROUND:

Decomposition is the physical and chemical breakdown of organic matter, or dead stuff. As plants, animals or their parts die, they lose their defenses to a host of organisms and environmental stressors which cause their breakdown. Bacteria, fungi, yeast, insects, worms, higher animals, and plants obtain nutrients from organic matter. Air, warmth, and moisture enhance the process because these provide optimum growth conditions for the above organisms to carry out their life processes.

Eventually organic matter is consumed and reconsumed until its form more closely resembles a dark, rich soil. This material (humus) is slowly mixed into the topsoil below by the actions of burrowing animals, such as earthworms (in moist soils), and insects (in drier soils). Humus is also washed down through the soil by percolating rainwater, through a process known as leaching.

Plants constantly absorb a water - nutrient - mineral solution through their roots, and use these in food-making and growth processes. Animals either eat plants or other animals. As these plants and animals die, decomposition begins, and nutrients are redistributed in a never-ending process called nutrient cycling.

Tropical rainforest soils usually can't sustain ranching or farming for more than a few years. They are usually shallow, less stable, less rich in minerals , older, less capable of nutrient storage or water retention, and highly prone to leaching and erosion in heavy rains. Decomposition here is so rapid that only large trees sport visible remains a week or two after death. Nutrients are rapidly recycled and absorbed, concentrated in the canopy. To clear a tropical rainforest causes massive nutrient loss, comparable to the clearing of a temperate forest **along with all of its topsoil.**

BEST COPY AVAILABLE

## ACTIVITY DIRECTIONS:

1. Introduce and explain vocabulary.
2. Divide the class into working pairs and equip them. Tell students they are to plan and implement a procedure (in the plastic container) to cause the fastest possible decomposition of a 20 gram single piece of orange peel.
3. Brainstorming—page 1 of journals should contain brainstorming ideas generated by each team, selected or not, with diagrams, drawings, etc.
4. Rules...no toxic substances or health risks, no flames, no physical tearing up of orange peels, no touching the peel once the experiment begins. Discuss these rules and develop more together as is necessary. Have students enter these rules in their journals and agree to abide by them.
5. Have each team submit a plan in their journals for your approval .Watch out for safety and feasibility.
6. Use balances to weigh out 20 gram orange peel slices. Eat the oranges.
7. Set up your experiments! Ask each group to stand and describe its method aloud, while everyone else predicts in their journals how many days each will take to decompose.
8. Appoint a panel of judgeswho will make inarguable determination as to when a peel has decomposed. Everyone will record daily, descriptive observations of his or her own peel.
9. As each student team succeeds in decomposing its peel, or correctly predicts the number of days for any other group's peel to decompose, declare these students to be "Spoiled Rotten". Certificates might also be in order.

## DISCUSSION TOPICS:

1. Which methods were effective and why? Isolate ideal conditions for decay and teach these to the class.
2. The rate of decomposition in tropical rainforest soils.
3. The concentration of nutrients in the canopy.
4. The fragile nature of tropical rainforest soils.

## ENRICHMENT:

1. Have students research tropical rainforest soils and what is happeneing to them. Focus on farming, cattle ranching, and on what happens after land is cleared for these uses. Provide film or illustrated text.
2. Composting: Call Metro Recycling for information on landfills, garbage composting. Build a small at-school composter, add food waste and yard debris regularly and observe all year. Record the weight of all that is composted! Also keep a soil thermometer in the compost, and one in the soil outside of the compost to demonstrate the heat energy given off by decomposition. Design home compost systems, too.
3. Take a field trip to a yard-debris composting center, to a sewage treat ment facility, to observe the management of decomposers and environmental conditions in the hastening of decay.

# THERE'S A HOLE IN THE CANOPY!

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- work safely with lab materials
- gather, format and interpret data
- make inferences based upon data
- comprehend phototropism and plant competition for light

CONCEPTS: 1.1—1.14, 1.19, 1.23, 1.24
PROCESSES: 2.1, 2.2, 2.3, 2.5, 2.7, 2.8, 2.9, 2.11, 2.12, 2.14, 2.15

### VOCABULARY:

- canopy
- competition
- exposure
- photosynthesis
- phototropism
- understory

### MATERIALS:

(For each group of 3-4 students) large cardboard box approximately 12 to 18 inches deep, and 18 x 18 inches at the base; 24 planters (milk cartons do well) with drainage holes punched in the bottom; tray—even plastic or foil, to catch extra water; soil; green bean seeds; moveable light source; serrated steak knife; heavy tape; small tray and paper towels; journals and pencils.

### BACKGROUND:

Green plants use sunlight to make their own food in a process called photosynthesis. It is the energy of sunlight that enables these plants to combine carbon dioxide and water to make glucose (simple sugar), and oxygen is released as a byproduct. Green plants have adapted to compete for this solar energy in several ways. Phototropism is such an adaptation. Green plants grow toward their most intense exposure to light. Sensing strong light, a plant concentrates growth hormones in such a way as to encourage the plant to grow toward that light. Trees bend and their leaders (tips) grow rapidly to occupy exposed space. Their branches also grow fuller and longer on exposed sides.

In tropical rainforests, some understory trees are shade tolerant, while others are adapted to waiting for an opening in the canopy. These trees then grow rapidly, literally racing one another to occupy the life-giving canopy space. Successful trees survive and have a greater chance of reproducing, thus selecting for survival of the fittest.

## ACTIVITY DIRECTIONS:

1. Seed germination—place bean seeds between several paper towels and keep them warm and moist. They'll germinate in just under a week.
2. Use serrated knives to safely cut the bottoms off of the cardboard boxes. Tape the top flaps of the boxes until they are closed to light.
3. Put 2-3 inches of soil in each planter, and plant a sprouting bean seed 1/4 to 1/2 inches deep in each.
4. Space plants evenly across your tray, and "name" each one, or number them for later identification.
5. Have students cut a 3 inch diameter hole somewhere in their boxes, along the top or on a side.
6. Put boxes over plants and hang light bulbs (one each) 6 inches from each box's opening. Water the plants evenly as needed. Keep the lights on between 8 to 24 hours per day, with regularity.
7. Monitoring
   Students should make daily observations and record data in their journals. Include descriptions on growth, measurements of individual plants, inferences as to cause and effect, etc. Begin with student predictions as to plant growth.

## DISCUSSION TOPICS:

A. Student observations, data-supported inferences
B. Student predictions and outcomes
C. phototropism—introduce this concept now that all have seen it.
D. Competition—for light, space, water, nutrients, pollinators, etc.
E. Carrying capacity—how many tropical rainforest seedlings can be supported as adult canopy dwellers? (very few!)

## ENRICHMENT:

**1.** Take your class on a walk through your school grounds and neighborhood and find examples of plants competing for light. Look up the trunks of trees for asymmetric growth. In Oregon, most growth will concentrate toward the south because the sun is in our "southern sky." It is just the opposite in southern latitudes. Near the equator, exposure to sunlight is more directly overhead, encouraging greater symmetry. Beware, plants will grow toward their greatest exposure to light. Houses, other trees and large objects often limit southern exposure, so the plant may grow more in another direction. Discuss these concepts as you find good examples.

**2.** Geotropism is a green plant's adaptation to grow perpendicular to the force of gravity. Try growing bean plants on record players, spinning at 3 or 4 different speeds. The centrifugal force will pull the plants outward, and they will respond geotropically, trying to maintain upright posture, with interesting results.

# THE BUILDING OF A PYRAMID... ENERGY FLOWS IN AN ECOSYSTEM

## ACTIVITY OBJECTIVES:

1. To familiarize students with the basic concept of the ecosystem.
2. To illustrate the flow of energy in an ecosystem with regard to living organisms and their environment and how they are interrelated and interact with one another.
3. To familiarize students with vocabulary commonly used in discussions of an ecosystem.

CONCEPTS: 1.1—1.14, 1.19, 1.23, 1.24
PROCESSES: 2.1, 2.2, 2.3, 2.5, 2.7, 2.8, 2.9, 2.11, 2.12, 2.14, 2.15

## VOCABULARY:

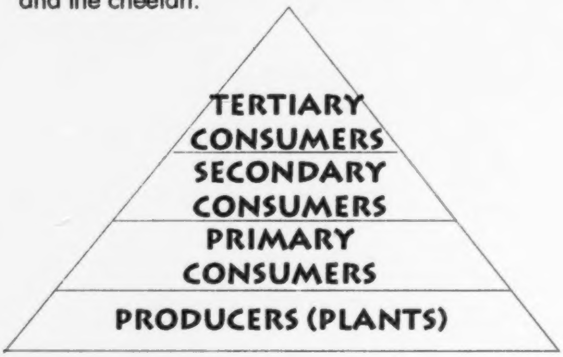
- abiotic substances
- autotrophic
- consumers
- decomposers
- ecosystem
- food pyramid
- heterotrophic
- primary consumer
- producer
- secondary consumer
- ertiary consumer (sometimes referred to as the indicator species)

## MATERIALS:

1. Reference materials to help define words and discuss food pyramid concept.
2. For appropriate level, materials to make a hanging mobile such as a coat hanger, string or yarn, construction paper, drawing materials or pictures of animals and plants of Africa.
3. Copies of the 'Model of Energy Flow in an Ecosystem' included in this activity.

## TEACHING SUGGESTIONS:

- This activity can be used as a pre- or post- visit exercise to the zoo. (It can also serve those that are unable to plan an on-site visit.)
- A food pyramid is a graphic illustration to help explain the flow of energy in an ecosystem.
- The concept states that the number of individuals in an ecosystem decreases in each ascending stage of the pyramid with the large number of producers (plants) at the base and progressively decreasing numbers of organisms moving upward.
- The group of organisms after the producers would be the primary consumers (herbivores), since they feed on plant material.
- The secondary consumers (omnivores and carnivores) would feed on producers(plant material) and the secondary consumers.
- The top of the pyramid contains the smallest number of organisms, the tertiary consumers who are not consumed by other organisms.
- With regard to the Africa savannah, these tertiatry consumers are animals such as the lion and the cheetah.



There are two activities here plus a number of enrichment or discussions that can be used as supplemental exercises.

- The first activity is used to get students familiar with the concept of a food pyramid. It is the drawing of a food pyramid with labels and then transferring that information to a mobile that will illustrate the concept.
- The second activity will be to work with a model that illustrates the flow of energy and relate that to the savannah or rainforest ecosystem.
- The enrichment activities follow.

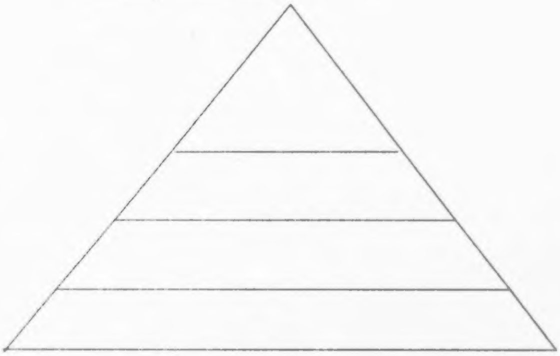
# THE BUILDING OF A PYRAMID... ENERGY FLOWS IN AN ECOSYSTEM

## VOCABULARY:

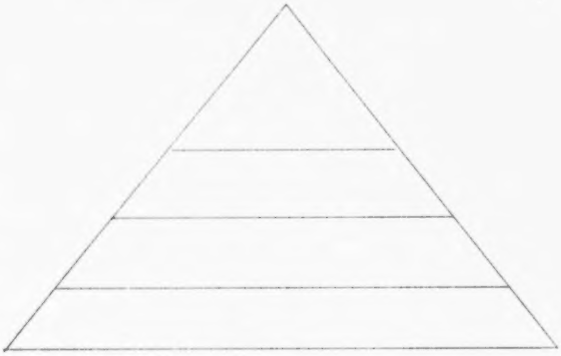
- abiotic substances
- autotrophic
- consumers
- decomposers
- ecosystem
- food pyramid
- heterotrophic
- primary consumer
- producer
- secondary consumer
- tertiary consumer (sometimes referred to as the indicator species)

## ACTIVITY DIRECTIONS:

1. Define the vocabulary words above using the directions that your teacher has given you.
2. Draw a picture of or study the following food pyramid. Using the following words, place them in the appropriate level of the pyramid.
   primary consumers
   producers
   secondary consumers
   tertiary consumers

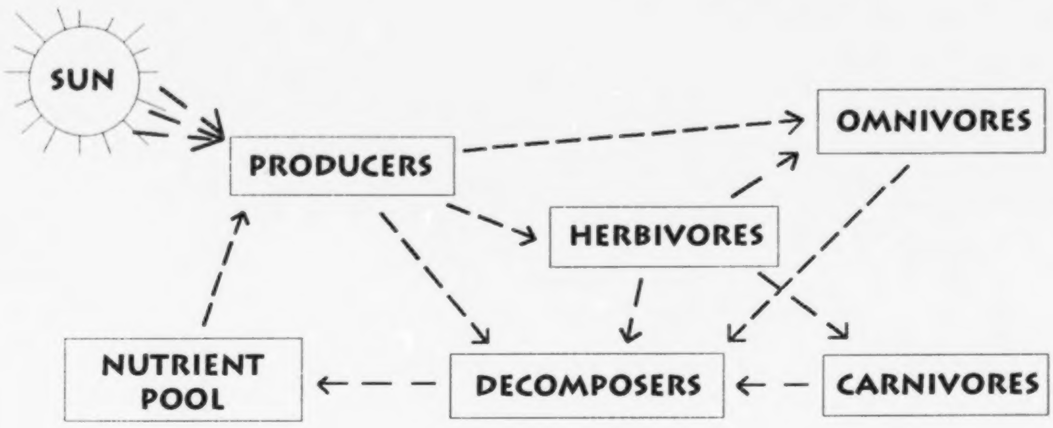


3. Now, using African savannah or rainforest animals that you have studied, place examples of organisms in the following blank pyramid at the appropriate levels.



4. Under your teachers direction, make a mobile that illustrates a food pyramid. Use drawings that you make of organisms or cut pictures from magazines of some African savannah or rainforest organisms and place them in the proper place on the mobile.

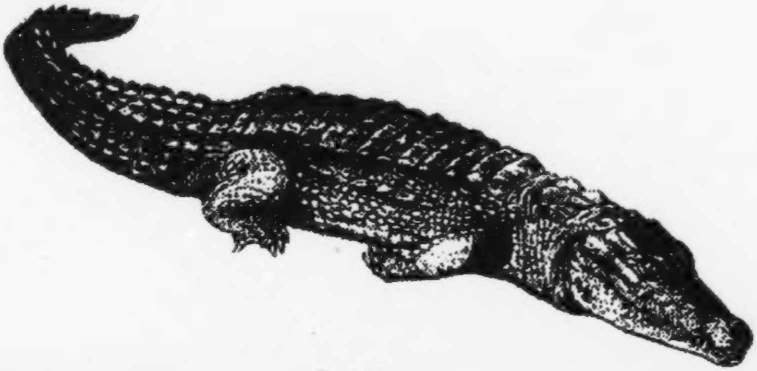
## MODEL OF ENERGY FLOW IN AN ECOSYSTEM



5. Study this simplified model of energy flow in an ecosystem and with a partner or in a class discussion, explain how this model works.
6. Answer the following question with regard to the above model and any vocabulary words that you have defined.
   - A. What is the primary source of energy for all organisms in an ecosystem?
   - B. Which organisms would you consider to be autotrophic?
   - C. Which organisms would you consider to be heterotrophic?
   - D. What is the primary role of the decomposers and why are they important?
   - E. Looking at the diagram, explain what you think the nutrient pool is.

### ENRICHMENT AND DISCUSSION:

1. For a classroom discussion or for further study, discuss how increased ranching and agricultural practices affect an ecosystem.
2. Look at some local ecosystems such as lakes, rivers, mountains, and oceans and apply them to the same activities as above.
3. Name some 'human-made' ecosystems and discuss the necessary components that have been developed for their success. (zoos, aquariums, etc.)
4. Observe one particular area near your school or on the school grounds. List all the parts of this micro-ecosystem.



# MAMMALS OF THE SAVANNAH

## Teacher Information

### ACTIVITY OBJECTIVES:

1. To familiarize students with various mammals of the African savannah.
2. To increase students awareness of animal adaptations to their environment.

CONCEPTS: 1.1—1.14, 1.19, 1.23, 1.24
PROCESSES: 2.1, 2.2, 2.3, 2.5, 2.7, 2.8, 2.9, 2.11, 2.12, 2.14, 2.15

### VOCABULARY:

- camouflage
- classification
- taxonomy

### MATERIALS:

- writing tool and the Mammals of the Savannah sheet

### TEACHING SUGGESTIONS:

- This activity is designed as an on-site zoo exercise.
- This activity is designed to get students to observe the animals of the Africa savannah exhibit and draw some conclusions about how thier species would live and survive due to their adaptations to environment.
- This activity also will allow students to become more familiar with the classification scheme used in science to identify any known living organism.
- You may want to prepare students before the zoo visit by discussing the classification system that is used in science.
- You may also want to show examples of animals that have very obvious color patterns that help them survive in their environment such as giraffes, zebras, lions, etc.

# MAMMALS OF THE SAVANNAH

**ACTIVITY DIRECTIONS:**
Complete the following data sheet as you travel throughout the African savannah exhibit. Pay close attention to all of the animals that you see and be sure to read the signs and look at the pictures that go along with each exhibit.

| ANIMAL | SCIENTIFIC NAME | COUNTRY | DIET | COLOR | ADAPTATIONS | PROTECTION |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
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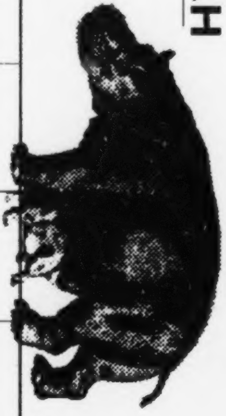


# IT'S ALL IN THE BILL

## Teacher Information

### OBJECTIVES:

1. To encourage students to use and improve observation skills.
2. To familiarize students with the variety of bird life that can be found in the African savannah and rainforest.
3. To use observation skills to identify various types of birds and look at their adaptations to their environment.

CONCEPTS: 1.1—1.14, 1.19, 1.23, 1.24
PROCESSES: 2.1, 2.2, 2.3, 2.5, 2.7, 2.8, 2.9, 2.11, 2.12, 2.14, 2.15

### VOCABULARY:

- aviary

### MATERIALS:

- writing tool and bird bill silhouette data sheet

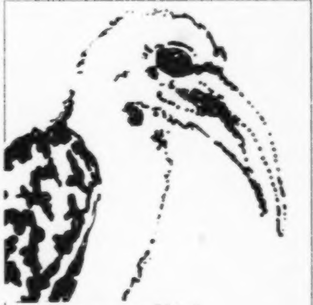
### TEACHING SUGGESTIONS:

- This activity is designed to be an on-site zoo exercise. (It can also be adapted to serve those that are unable to plan an on-site visit.)
- This activity is designed to encourage students to use observation skills to identify a variety of birds that live in the Africa savannah and rainforest.
- You will want to use this activity in the aviary that is in the beginning of the Africa exhibit and in the aviary in the zoo rainforest area of the Africa exhibit.
- This activity is also designed to get students to look at the shape of bird bills and make some assumptions about what kinds of food each bird eats.
- On the data sheet are several silhouettes of bird bills that students should study before their visit to the zoo.
- It is suggested that as a class, you discuss the various shapes of the bird bills and how those bills are adapted to the types of food each bird eats. For example, long, thin bills are usually found on birds that visit flowers and drink nectar while a bird with a short, strong and hooked bill will use that bill to crack nuts or other hard objects.
- Encourage students to also use the signs and pictures along the paths to identify specific birds that are examples of each type.

# IT'S ALL IN THE BILL

## ACTIVITY DIRECTIONS:

1. Before visiting the zoo, look at the different types of bird bills on this bird bill data sheet. As a class, discuss the different shapes and how each shape might be useful for a bird when it is gathering food.
2. Think about some birds that you see in your own yard or local area and describe how they may be adapted to gather food and survive.
3. When you get to the zoo, use the 'Bird Bill Data Sheet' to help you identify birds and organize your observations. Complete the table by using signs and pictures along the pathways of the aviary and the Africa rainforest exhibits.

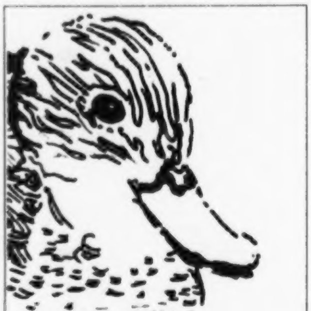


common name of bird

scientific name

types of food it eats (diet)

where it lives

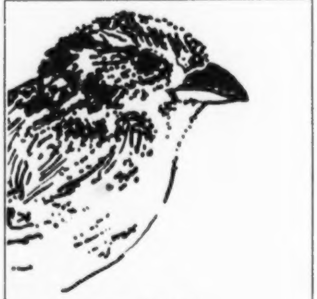


common name of bird

scientific name

types of food it eats (diet)

where it lives

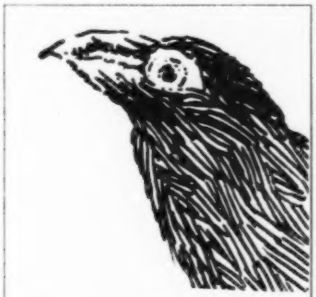


common name of bird

scientific name

types of food it eats (diet)

where it lives

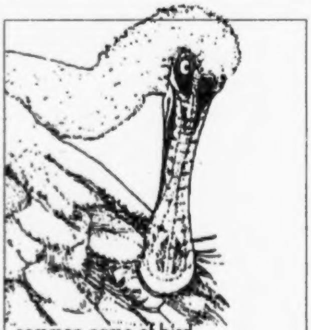


common name of bird

scientific name

types of food it eats (diet)

where it lives

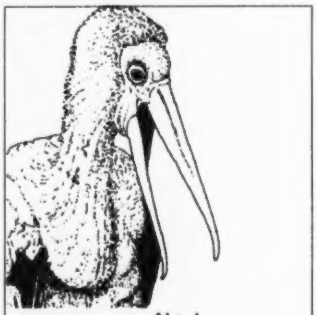


common name of bird

scientific name

types of food it eats (diet)

where it lives



common name of bird

scientific name

types of food it eats (diet)

where it lives

# IN THE CARDS

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- know a variety of African savannah and tropical rainforest wildlife
- use references to research information.
- classify these animals by their feeding habits or by phyla.

CONCEPTS: 1.5, 1.10, 1.11, 1.12, 1.14
PROCESSES: 2.6, 2.15

### VOCABULARY:

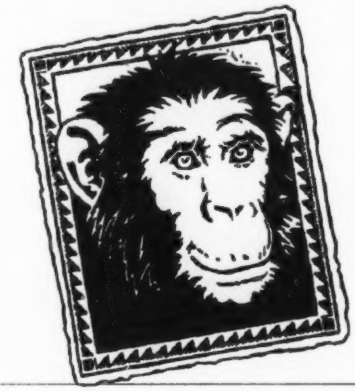
- amphibian
- bird
- browser
- carnivore
- fish
- grazer
- herbivore
- mammal
- omnivore
- predator
- reptile
- scavenger.

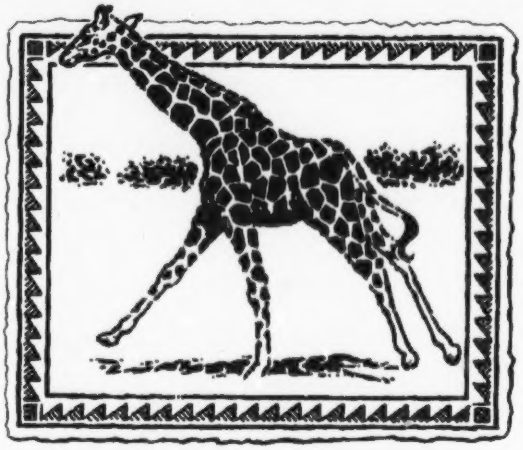
### MATERIALS:

- attached lists of animals to be researched by students
- approximately 60 3x5 cards for every team of 5-6 students
- colored pencils or other drawing materials
- encyclopedias and wildlife references with a focus on Africa.

### ACTIVITY DIRECTIONS:

1. Form teams of 5-6 students with some teams choosing tropical rainforest, and others choosing savannah for their research.
2. Review or introduce the vocabulary words at left, discussing examples with the class. Display these words prominently in the room.
3. Give each group its list of animals without the descriptions of their feeding habits. The group's task is now to research these animals, discover their feeding habits and find a picture of each animal.
4. For each animal, students must create a playing card complete with a drawing of the animal and its name. Each team will make one full deck of either savannah or tropical rainforest animals.
5. The group must also produce a list of their animals, noting whether each is a fish, amphibian, reptile, bird, mammal, predator, scavenger, herbivore, carnivore, omnivore, grazer, or browser.
6. Check decks when completed, and let students compare their finished lists to the key, and make corrections. Laminate cards to make them last.
7. Now play "Savannah!" or "Tropical Rainforest!", depending upon which deck each group has. The rules are the same:





Deal 5 cards per player. The player to the dealer's left takes a card from the top of the deck, and must discard a card, creating a discard pile next to the deck. Thereafter each player chooses either the top card from the deck or the top card from the discard pile, and always discards one card.

The object of the game is to form 5 of a kind. This could be 5 fish, 5 amphibians, 5 reptiles, 5 birds, 5 mammals, 5 scavengers, 5 herbivores, 5 carnivores, 5 omnivores, 5 grazers, or 5 browsers. winner is the first person to play 5 of a kind, discard their 6th card and yell"Savannah!", or "Tropical Rainforest!".

**8.** At first, students will need their descriptive lists to know these facts about the animals on their cards. Between games have them drill one another, memorizing each animal's phylum and feeding behaviors. Eventually take their lists away, playing from memory, only using lists to solve disputes. As groups master the game, have them switch decks and play the other game.

### ENRICHMENT:

**1.** Play "concentration" with a deck. Make your own rules as to what constitutes a match.

**2.** Crazy 8's - sort of. Fish, amphibians, reptiles, birds and mammals are "suits", while feeding behavior descriptions act as numbers. For example, if one player plays "Honey Badger", which is a mammal, an omnivore and a predator, the next player must play another mammal, or play an omnivore-predator, such as "Hornbill", and thereby changing the suit from mammals to birds. Designate your own wild card.

203

## ANIMAL LISTS FOR CARDS

# SAVANNAH

### FISH

| | |
|---|---|
| African lungfish | carnivore, predator |
| barbel fish | omnivore |
| African catfish | carnivore, predator |
| killifish | carnivore, predator |
| cichlids | omnivores |

### REPTILES

| | |
|---|---|
| rock python | carnivore, predator |
| bull python | carnivore, predator |
| bush snake | carnivore, predator |
| black mamba | carnivore, predator |
| savannah monitor | carnivore, predator |
| puff adder | carnivore, predator |
| African tortoise | omnivore, predator |

### BIRDS

| | |
|---|---|
| malachite kingfisher | carnivore, predator |
| helmeted guineafowl | omnivore, predator |
| red-billed quelea | herbivore |
| shoebill | carnivore, predator |
| hammerhead | carnivore, predator |
| yellow-billed stork | carnivore, predator |
| African white spoonbill | carnivore, predator |
| southern-masked weaver | herbivore |
| marabou stork | carnivore, scavenger |
| orange-breasted avadavit | omnivore, predator |
| brown-breasted barbet | omnivore, predator |
| African Jacana | omnivore, predator |
| grey-headed kingfisher | carnivore, predator |
| ostrich | herbivore, browser |
| gold-breasted starling | omnivore, predator |
| salvadoris weaver | herbivore |
| cape thick-knee | carnivore, predator |
| hottentot teal | omnivore, predator |

### MAMMALS

| | |
|---|---|
| dik dik | herbivore, browser |
| crested porcupine | omnivore, scavenger |
| impala | herbivore, grazer |
| cheetah | carnivore, predator |
| jackal | carnivore, predator, scavenger |
| spotted hyena | carnivore, predator, scavenger |
| striped hyena | carnivore, predator, scavenger |
| aardvark | carnivore, predator |
| aardwolf | carnivore, predator |
| elephant | herbivore, browser, grazer |
| gazelle | herbivore, grazer |
| springbok | herbivore, grazer |
| eland | herbivore, grazer, browser |
| honey badger | omnivore, predator |
| bushbaby | omnivore, predator |
| serval | carnivore, predator |
| lion | carnivore, predator, scavenger |
| banded mongoose | carnivore, predator |
| Hartmann's mountain zebra | herbivore, grazer |
| black rhinoceros | herbivore, browser |
| hippopotamus | herbivore, grazer |
| reticulated giraffe | herbivore, browser |
| kudu | herbivore, grazer |

# RAINFOREST

## AMPHIBIANS

| | |
|---|---|
| African tree frog | carnivore, predator |
| giant bullfrog | carnivore, predator |
| goliath frog | carnivore, predator |
| viviparous toad | carnivore, predator |
| reed frog | carnivore, predator |

## BIRDS

| | |
|---|---|
| Hadada ibis | carnivore, predator, scavenger |
| Hartlaub's Touraco | herbivore |
| great blue touraco | herbivore |
| hornbill | omnivore, predator |
| crowned eagle | carnivore, predator |
| African grey parrot | herbivore |
| African honeyguide | predator, carnivore |
| violet plaintain-eater | herbivore |
| senegal parrot | herbivore |

## REPTILES

| | |
|---|---|
| gecko | predator, carnivore |
| chameleon | predator, carnivore |
| vine snake | predator, carnivore |
| rock python | predator, carnivore |
| Gaboon viper | predator, carnivore |
| cobra | predator, carnivore |
| African slender-snouted crocodile | predator, carnivore |
| Nile monitor | predator, carnivore |

## MAMMALS

| | |
|---|---|
| red colobus monkey | herbivore |
| black and white colobus monkey | herbivore |
| Wahlberg's Epauletted Fruit Bat | herbivore |
| straw colored fruit bat | herbivore |
| L'Hoest's monkey | omnivore, predator |
| mandrill | omnivore, predator |
| Diana monkey | omnivore, predator |
| leopard | carnivore, predator |
| small spotted genet | carnivore, predator |
| elephant | herbivore, browser, grazer |
| okapi | herbivore, browser |
| mongoose | carnivore, predator |
| sitatunga | herbivore , browser |
| bongo | herbivore, browser |
| cape clawless otter | carnivore, predator |
| red river hog | herbivore |
| long-tailed pangolin | predator, carnivore |
| DeBrazza's monkey | omnivore, predator |
| potto | omnivore |
| pygmy hippo | herbivore, grazer |
| cusimanse | carnivore, predator |

# MADE IN THE JUNGLE

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify products of African rainforest and find products in their homes.

SOCIAL STUDIES CCG'S: 1.1, 1.2, 1.4, 1.6, 3.3, 3.4, 6.1, 7.3, 7.4, 8.1.

### MATERIALS:

- Copies of the rainforest product information.
- Copies of the Made in the Jungle activity sheet.

### ACTIVITY DIRECTIONS:

- Have students brainstorm rainforest products and their uses.
- Tell students that many of the things we use daily originated in tropical forests.
- Show them samples of the products from the rainforest.
- Review the directions for completing the Made in the Jungle activity sheet.
- Have students complete the sheet at home.
- Have individuals or groups share their findings, graph the class results.

### ENRICHMENT:

- What are the environmental issues related to the harvest/use of these products?
- Create a menu of rainforest foods.
- Write directions for making a dessert using products from the rainforest such as cocoa, coconut, bananas, etc.
- Have students write math problems related to the cost of products from the rainforest. Share the problems, and have friends try to solve them.

# MADE IN THE JUNGLE

## Rainforest Product Information

The African rainforest produce a treasure chest of natural resources: minerals, agricultural products and forest products. The demand for these resources has dramatically increased the destruction of this natural treasure. Many items made from rainforest products can be found in our houses.

Many of the foods we eat, as well as many of the spices and flavors we use to enhance our foods come directly from tropical rainforests. Foods include fruits, vegetables, cocoa, coffee, and nuts.

Some of the world's most beautiful woods used to make furniture, boats, and other items come from tropical rainforest trees including teak, mahogany, and rosewood.

Tropical fibers can be found in common packing materials such as twine and rope. Fibers from stems of different species of palms are used to make woven goods, cane chair seats, hats, and knit fabrics.

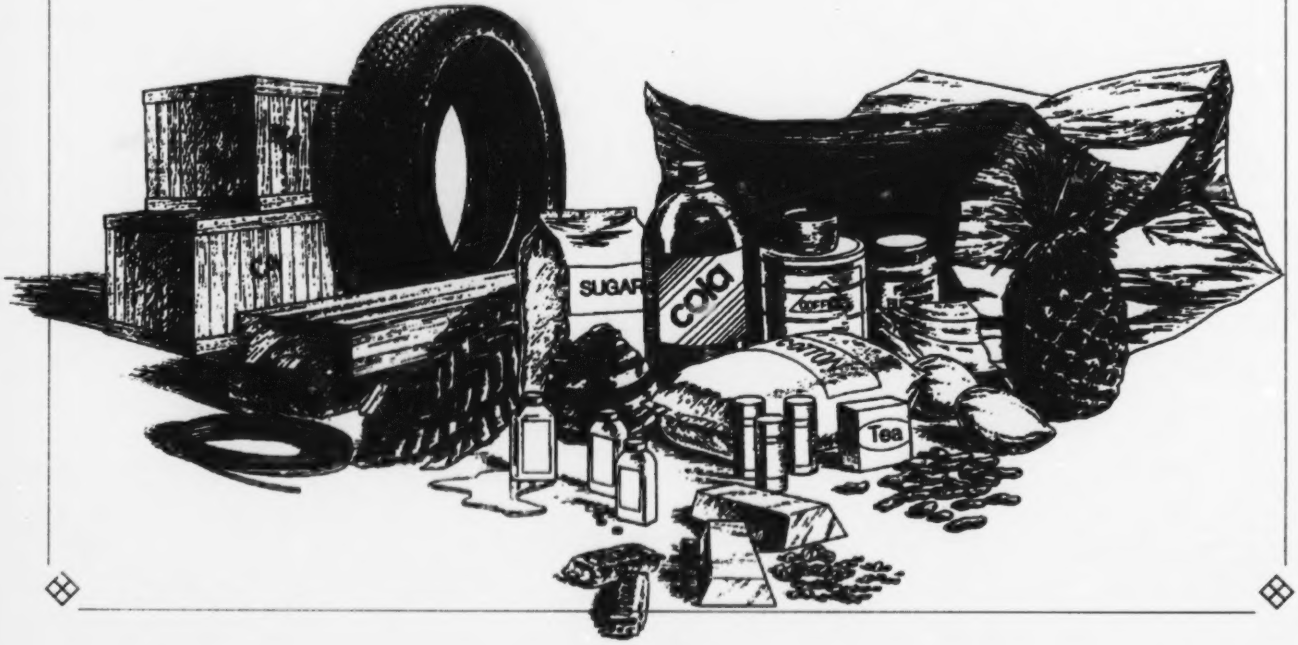
Many of the evergreen plants that grow in tropical rainforests also grow successfully indoors as houseplants. Common houseplants from the tropical rainforests include African violets, bromeliads, diffenbachia, orchids, prayer plants, rubber plants, and Schefflera.

We use many household products containing oils such as snack foods, baked goods, food flavoring, perfumes, soap, lotions, and cleaning supplies.

Products made from gums and resins are also abundant in our houses such as chewing gum, balls, balloons, rubber bands, varnishes.

### AT THE ZOO

Try to answer the questions located on the boxes and barrels at the Kongo Ranger Station about products of the rainforests.



# MADE IN THE JUNGLE

See how many of these products from the tropical rainforest you can find in your house and check them off on this sheet. Mark where you found the product and what it is used for. Compare your findings with your classmates, and graph the results.

| SPICES | LOCATION | USE |
|---|---|---|
| __allspice | | |
| __black pepper | | |
| __cardamom | | |
| __cinnamon | | |
| __cloves | | |
| __cocoa | | |
| __ginger | | |
| __mace | | |
| __nutmeg | | |
| __paprika | | |
| __vanilla | | |

| FRUITS AND VEGETABLES | | |
|---|---|---|
| __banana | | |
| __heart of palm | | |
| __lime | | |
| __mango | | |
| __orange | | |
| __papaya | | |
| __pepper | | |
| __pineapple | | |
| __potato | | |
| __sweet potatoe | | |
| __tangerine | | |

| OTHER FOOD | | |
|---|---|---|
| __coconut | | |
| __coffee | | |
| __nuts | | |
| __peanuts | | |
| __rice | | |
| __sugar | | |
| __tea | | |

| GUMS AND RESINS | | |
|---|---|---|
| __chicle | | |
| __copal | | |
| __dammar | | |
| __rubber | | |

| PLANTS | LOCATION | USE |
|---|---|---|
| __African Violet | | |
| __begonia | | |
| __bromeliads | | |
| __Christmas cactus | | |
| __Dieffenbachia | | |
| __Dracena | | |
| __fiddle-leaf fig | | |
| __palm | | |
| __orchids | | |
| __Philodendron | | |
| __prayer plant | | |
| __rubber plant | | |
| __Schefflera | | |
| __zebra plant (Aphelandra) | | |

| WOOD | | |
|---|---|---|
| __balsa | | |
| __mahogany | | |
| __rosewood | | |
| __sandalwood | | |
| __teak | | |

| FIBERS/CANES | | |
|---|---|---|
| __bamboo | | |
| __jute | | |
| __kapok | | |
| __ramie | | |
| __rattan | | |

| OILS | | |
|---|---|---|
| __bay | | |
| __camphor | | |
| __coconut | | |
| __lime | | |
| __palm oil | | |
| __rosewood | | |
| __sandalwood | | |

# MADE IN THE JUNGLE

## Answer Key

*answers will vary

| SPICES | LOCATION | USE |
|---|---|---|
| __allspice | kitchen | pumpkin pies |
| __black pepper | kitchen | flavoring |
| __cardamom | " | " |
| __cinnamon | " | " |
| __cloves | " | " |
| __cocoa | " | chocolate |
| __ginger | " | pumpkin pies, flavoring |
| __mace | " | flavoring |
| __nutmeg | " | " |
| __paprika | " | " |
| __vanilla | " | cookies, cakes |

| FRUITS AND VEGETABLES | | |
|---|---|---|
| __banana | " | snack |
| __heart of palm | " | salad |
| __lime | " | flavoring |
| __mango | " | snack |
| __orange | " | snack |
| __papaya | " | drink |
| __pepper | " | flavoring |
| __pineapple | " | snack, salad |
| __potato | " | side dish |
| __sweet potatoe | " | " |
| __tangerine | " | snack |

| OTHER FOOD | | |
|---|---|---|
| __coconut | " | cakes, cookies |
| __coffee | " | drink |
| __nuts | " | snack, baked goods |
| __peanuts | " | " |
| __rice | " | side dish |
| __sugar | " | baked goods, flavoring |
| __tea | " | drink |

| GUMS AND RESINS | | |
|---|---|---|
| __chicle | kitchen | chewing gum |
| __copal | garage<br>office | varnish<br>printing ink |
| __dammar | garage | varnish, lacquer |
| __rubber | all rooms | balloons, erasers, foam rubber, balls, rubber bands, gloves, hoses, shoes, tires |

| PLANTS | LOCATION | USE |
|---|---|---|
| __African Violet | living room | decoration |
| __Begonia | " | " |
| __bromeliads | " | " |
| __Christmas cactus | " | " |
| __Dieffenbachia | " | " |
| __Dracena | " | " |
| __fiddle-leaf fig | " | " |
| __palm | " | " |
| __orchid | " | " |
| __Philodendron | " | " |
| __prayer plant | " | " |
| __rubber plant | " | " |
| __Schefflera | " | " |
| __zebra plant (Aphelandra) | " | " |

| WOOD | | |
|---|---|---|
| __balsa | " | furniture, building materials |
| __mahogany | " | furniture, building materials |
| __rosewood | " | furniture, building materials |
| __sandalwood | " | furniture, building materials |
| __teak | boat | furniture, building materials |

| FIBERS/CANES | | |
|---|---|---|
| __bamboo | living room | cane furniture, crafts |
| __jute | garage | rope, twine, burlap |
| __kapok | family room | insulation, stuffing |
| __ramie | closet | knit materials |
| __rattan | living room | furniture, wicker, cane chairs |

| OILS | | |
|---|---|---|
| __bay | bay rum lotion | |
| __camphor | bathroom | insect repellent, medicine |
| __coconut | kitchen<br>bathroom | snack foods, baked goods,<br>lotions, soap |
| __lime | kitchen<br>bathroom | food flavoring, candles,<br>soap, bath oil |
| __palm oil | kitchen | snack foods, baked goods |
| __rosewood | bedroom | perfume, oils |
| __sandalwood | bathroom | soap, candles, perfume |

# AFRICA'S TROPICAL SAVANNAH ECONOMY

## Teacher Information

### ACTIVITY OBJECTIVE:

Students will be able to identify the five major cash crops and five raw materials, and understand the problems of being dependent on a single crop or resource.

Social Studies CCG's: 1.1, 1.2, 1.4, 1.6, 3.3, 3.4, 6.1, 7.3, 7.4, 8.1.

### MATERIALS:

- Copies of the list of cash crops and raw materials of the savannah region for each group of students (this information may be shown on an overhead).
- Copies of the Price List A for cash crops and raw materials for each group of students (this information may be shown on an overhead).
- Copies of the Price List B for cash crops and raw materials for each group of students (this information may be shown on an overhead).

### ACTIVITY DIRECTIONS:

- Create six to eight teams with four members each. Each team represents a country and will make decisions about what products it wants to produce for crops.
- Have each group of students select three items for their country to produce.
- Show the group Price List A for the cash crops and raw materials.
- Allow students time to decide if they want to change production patterns to maximize returns. (They may choose to select one product to fill all three spots, or continue to diversify with three different products.)
- Show the group Price List B for the cash crops and raw materials.
- Have students discuss what happened to countries when prices changed.
- Ask students to predict what happened to countries who selected only one product to produce. What happened to the groups that did this? Why is this a dangerous situation for an economy?
- Have individuals or groups share their profits or losses, graph the class results.

### ENRICHMENT:

- What are the environmental issues related to the harvest/use of these products?

# AFRICA'S TROPICAL SAVANNAH ECONOMY

## Background Information

Approximately nine out of ten Africans in this region make their living from either farming or herding, however most are farmers. These farmers often grow food crops for themselves and their communities such as millet, sorghum, and corn. Many farmers also raise cash crops. These cash crops are sold to companies which process them and sell them in a variety of products. The most common cash crops are cotton, coffee, cacao (for cocoa), and peanuts. Because much of the soil is not fertile, farmers often have to use a pattern of shift cultivation, where they use a field one year and then let it grow wild for several years before using it again.

The savannah region has little manufacturing by our standards. Traditionally, the resources of Africa have been taken to Europe and other industrially developed areas as raw materials for their own industries. Today African nations are trying to build a manufacturing base, but foreign companies and workers still dominate local industry. African countries must slowly build a skilled labor force that will eventually give these countries greater control of their raw materials and thus be less reliant on the rest of the world. Some of the major resources are petroleum, iron, hydroelectric power, copper, bauxite, and gold.

A serious problem for countries in this region is becoming a single resource economy. For example, Zambia has relied heavily on copper sales and Nigeria's major income is from petroleum; when prices paid for these resources drop, the economies of these countries are badly hurt. Consequently, some of the countries (such as Nigeria) have invested great amounts of money into developing other industries.

# AFRICA'S TROPICAL SAVANNAH ECONOMY

## PRODUCTS OF THE SAVANNAH

### PRICE LIST A

CASH CROPS

cotton-$5/unit
coffee-$2/unit
cacao-$1/unit
peanuts-$1/unit
tea-$1/unit

RAW MATERIALS

petroleum-$10/unit
gold-$4/unit
copper-$1/unit
bauxite-$1/unit
iron-$1/unit

### PRICE LIST B

CASH CROPS

cotton-$1/unit
coffee-$3/unit
cacao-$3/unit
peanuts-$3/unit
tea-$2/unit

RAW MATERIALS

petroleum-$1/unit
gold-$4/unit
copper-$2/unit
bauxite-$4/unit
iron-$3/unit

# CARING NOW FOR THE FUTURE OF LIFE

## GRADES 6-8

CARING NOW FOR THE FUTURE OF LIFE is designed to show students that they can shape the future by their actions today. Through these activities, students will gain an increased awareness of environmental issues related to the air, land, and water. It is our hope that students will learn to become better caretakers of the earth.

A variety of activites are included to help students better understand their role in caring for the future of life on the planet of Earth. Activities may be selected for use from the following descriptions:

### SOS SAVE OUR SOIL

- Students learn about the concepts of erosion, soil water retention and surface runoff by applying erosion control techniques in models.

### LANGUAGE ARTS AND AFRICA

- Students write in several modes about issues related to African rainforest and savannnah.

### GLOBAL WARMING

- Students study basic greenhouse effect dynamics and terminology.

### "THE HEAT IS ON"-CO2 V.S. AIR

- Students learn that gasses have different physical and chemical properties, among these, heat retention, and they study how heat contributes to the greenhouse effect.

### CO2 AND YOU

- Students identify fossil fuels and their applications, appreciate our overwhelming dependence on fossil fuels, and learn how they can change their behavior to conserve fossil fuels and reduce CO2 emissions and waste.

### SUSTAINED USE LIVING WITH TROPICAL RAIN FOREST

- Students learn about the concepts of land productivity, intensive v.s. extensive cultivation, and sustained use, learn about productivity of tropical rainforests.

### CARING NOW FOR OUR FUTURE

- Students learn about reasons to care for our future now.

Other activities can be adapted from the starred activities in the 3rd-5th Grade Level section.

# S.O.S....SAVE OUR SOIL!

## ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- understand the concepts of erosion, soil water retention and surface runoff.
- apply erosion control techniques in models.
- understand our dependence on soil.
- understand differences in soils and conditions between temperate forests, tropical rainforests and savanna.

CONCEPTS: 1.1, 1.2, 1.6, 1.7, 1.11-1.14, 1.19, 1.22, 1.23

PROCESSES: 2.1-2.3, 2.5, 2.11-2.15

## VOCABULARY:

- contour plowing
- crop rotation
- decompose
- erosion
- groundcover
- organic matter
- strip-cropping
- terracing
- topsoil
- windbreaks

## MATERIALS:

(for each group of 3-4 students) 2 low-cut wooden boxes(or reinforced cardboard) approximately 4 inches deep x 2 feet x one foot; 1 large plastic garbage bag; topsoil or potting soil to fill both boxes 3 inches deep;2 1-gallon sprinkle buckets; seeds—grass, garden vegetable, bird or rodent mix—a variety; 6 popsicle sticks; metric beaker or measuring cup; serrated steak knife; one bucket for the class; student texts "S.O.S....Save Our Soil"; "S.O.S...Vocabulary Review" activity.

## ACTIVITY DIRECTIONS:

Part One - Tropical Rainforest Simulation

1. Introduce the vocabulary words and read the student text "S.O.S....Save Our Soil" aloud as a class, and discuss what students already know on these topics.
2. Now form groups of 3 - 4 students. Each group will simulate 2 plots, either "undisturbed tropical rainforest v.s. cleared tropical rainforest", or "undisturbed temperate forest v.s. cleared temperate forest". Make sure both simulations are chosen fairly evenly, so that all will be observed repeatedly.
3. The plots:

A. Line each box with plastic cut from a garbage bag, so it's waterproof.

B. Fill with soil 3 inches deep, evenly.

C. Designate one of the narrower sides as "bottom", it will be the bottom when the plot is later tilted. Cut a 2 inch gap in the center of the "bottom" side, just down to soil level. Use plastic and tape to waterproof this gap. Water will drain through this gap during later "rains", and can be collected here with a bucket.

D. Plant seeds densely, in all undisturbed plots, and allow no growth on cleared plots. Water all plots equally.

E. Place 3 popsicle sticks in the soil of each plot, as depth markers at the top, middle and bottom of the field. Mark each stick with pencil at initial soil depth.

F. Now have students predict amounts of soil loss, surface runoff, soil water retention and severity of erosion on the plots.

G. When plants are dense and several inches tall, tilt all plots roughly 30 degrees, and "rain" on each as follows:

- Temperate Forests.
  2 liters water from one sprinkle bucket.

- Tropical Rainforests.

4 liters water from 2 sprinkle buckets
This simulates harder, more voluminous tropical rains.

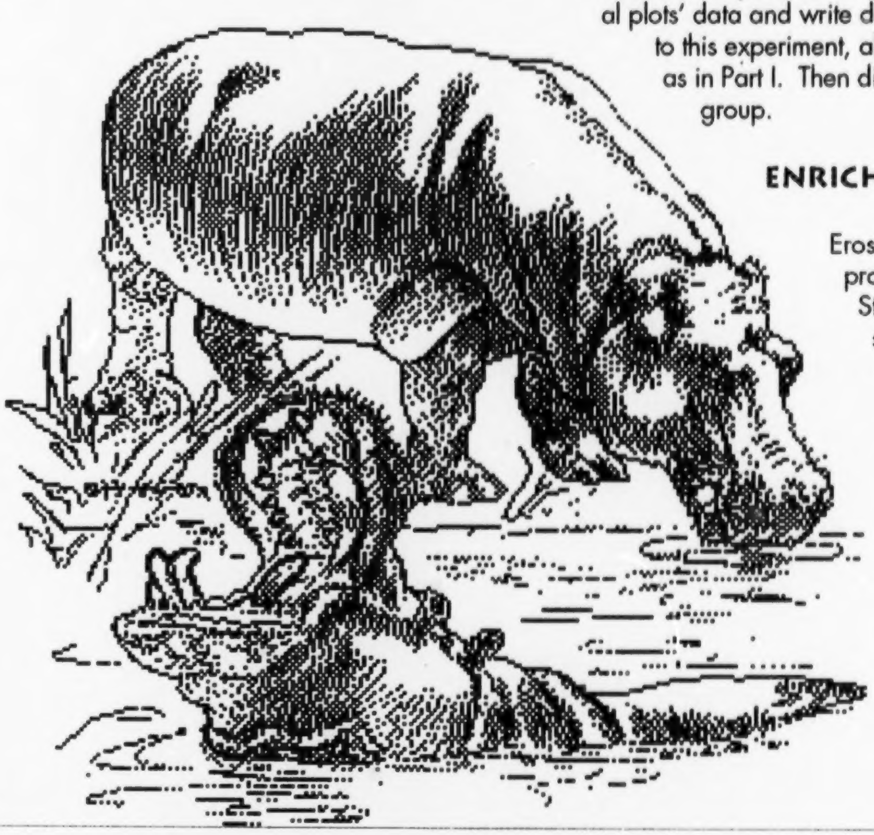
H. During each rain, use a bucket to catch surface runoff through the gap, and measure its volume. Have students generally rate the clarity or muddiness of the water and record ratings. Record volume of surface runoff, and measure how many millimeters of soil were lost or gained at each popsicle stick site. Discuss these observations.

## CONCLUSION:

Have students read, organize, interpret, or even graph their findings, comparing disturbed v.s. undisturbed plots. Have them submit written conclusions regarding the role of groundcover in erosion control, water retention and water quality. Encourage them to back their conclusions with data. Finally, discuss these written conclusions as a class. *SAVE THE PLOTS FOR PART II

## PART TWO
## SAVANNAH SIMULATION

1. Use a sloped plot to demonstrate erosion prevention techniques from the student text. Save one plot as a control plot.
2. Starting from bare soil again, challenge each group to "erosion-proof" their 2 plots using techniques from this activity.
3. Hint: Soil re-shaping must occur before planting, and don't use mixed seeds, as they don't look like uniform crop-cover.
4. Allow several weeks for in-ground germination and growth, watering when needed.
5. Now have students predict which plots will save the most soil, retain the most water, lose the most surface runoff, and why.
6. "The Rainy Season". Use a sprinkle bucket to produce a 2 - 3 liter rain on each plot. Have students record observations and data just as in Part I.
7. Now rain on the bare control plot. Have students compare control data to the experimental plots' data and write data-based conclusions to this experiment, along the same format as in Part I. Then discuss these as a group.



## ENRICHMENT:

Erosion is a serious problem in the United States, too. Assign your student groups the task of researching the history and current status of our battle against erosion.

# S.O.S....SAVE OUR SOIL!

People worldwide depend upon fertile topsoil to provide plants for food and animal feed, timber and many other products. It takes centuries to form an inch of topsoil, but erosion can remove it rapidly. Erosion is a natural process by which soil is removed from where it was formed. Water, wind, and especially human activity often combine to erode soils faster than they form. It is estimated that half of Iowa's topsoil has eroded since farming began there. Erosion is a serious problem.

Erosion in tropical rainforests is extreme. Soils here are shallow and poor. As organic matter decays it is used by plants and animals rapidly. Nutrients are concentrated in the canopy, and not stored in the soil. When the forest is cleared and burned for farms or ranches, heavy rains wash away nutrients, and eventually the soil, too. After a few years the land is useless, and it is abandoned. New forest is cleared and burned and the cycle of destruction continues. Obviously, the forest is not endless, and this practice can't continue...If people are to survive and live on this land, the forest must continue to live.

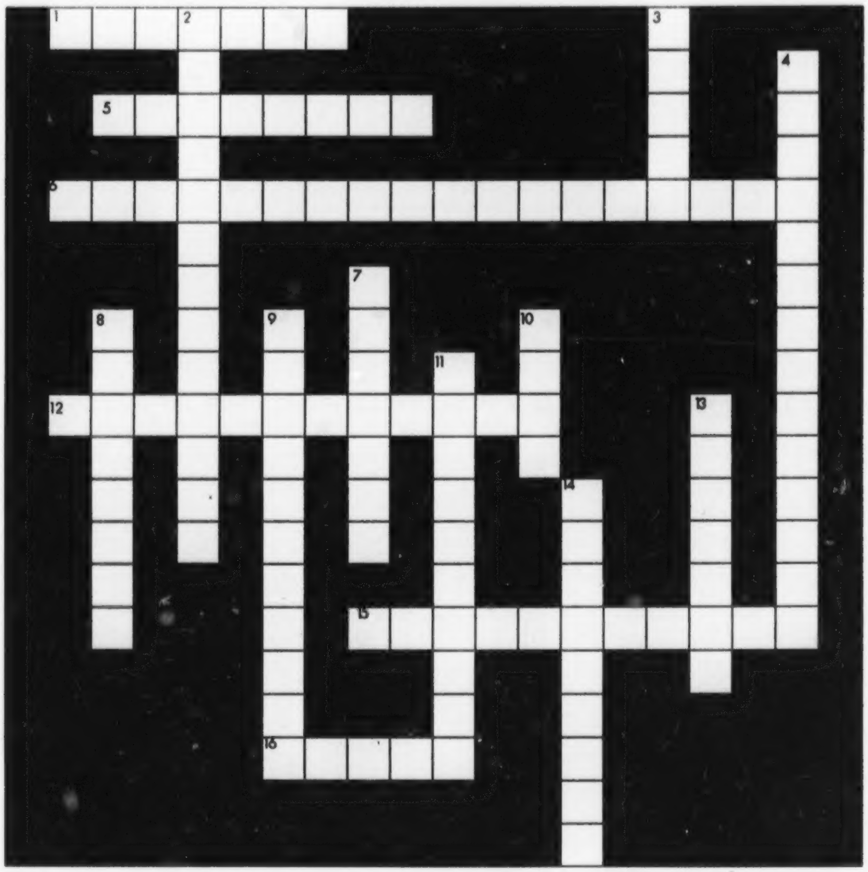
Erosion also threatens savannah peoples and their soils. The herbs, grasses, shrubs and woodlands act as natural soil anchors, and also absorb excess water from rains. While termites eat many of these plants, predators keep termite populations down. People clear this land for farms, or use it to graze herds of cattle. If land is cleared for farms or overgrazed, it may be left unprotected from the heavy afternoon rains of the rainy season, and erosion can be severe and fast. Human activity also reduces the termite predator populations, which causes termite numbers to explode. It can be a race between termites and cattle to strip the ground of its plant cover.

Yet several erosion control techniques can help control erosion, and assure good topsoil for farming and ranching long into the future.

1. Manage the grazing: Cattle must not be allowed to completely denude land.
2. Groundcover: After the harvest of a primary crop, plant a cover crop that will protect and enrich the soil, until plowing for the primary crop begins again.
3. Strip-Cropping: Farmers may alternate rows or whole sections of field in tall/short, or deep/shallow rooted crops to hold down the soil.
4. Crop Rotation: By rotating which crop is grown on a plot of land, farmers can revitalize soils. Different plants use and contribute different soil nutrients.
5. Windbreaks: These are tall rows of trees planted at a field's edge to reduce wind erosion.
6. Contour Plowing: Farmers plow across slopes , creating furrows that catch rain, and hold it long enough to be absorbed by the soil. Plowing up and down a slope encourages water to run fast, stripping the soil.
7. Terracing: People rebuild steep slopes into a series of stair-stepped, level fields, called terraces. This allows them to control the flow of water and prevent erosion.

216

## S.O.S...VOCABULARY REVIEW



### ACROSS

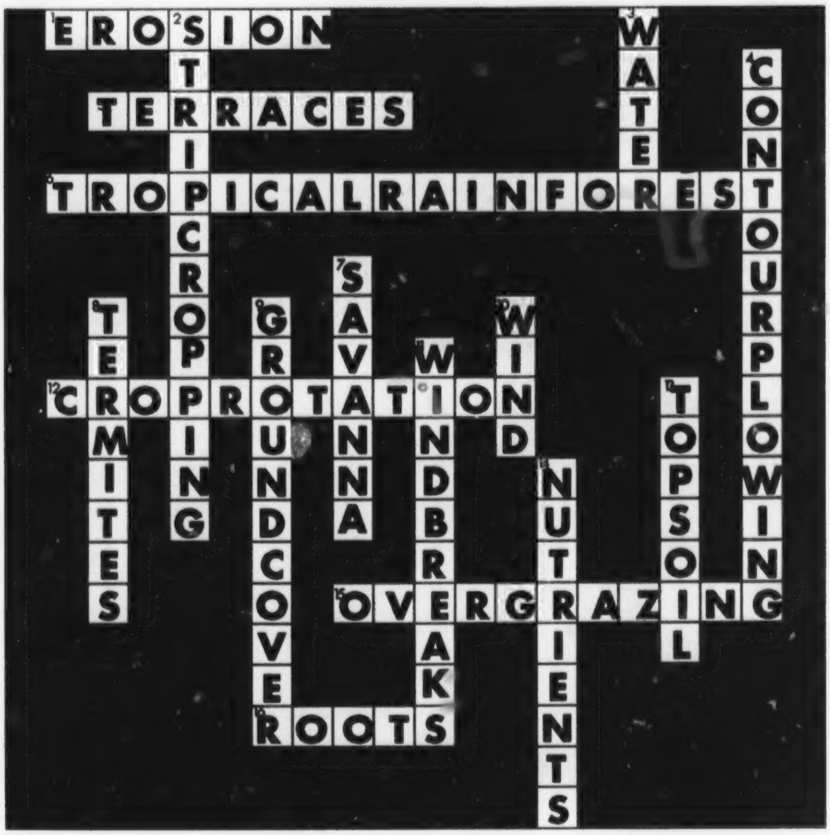
1. Natural process of topsoil removal.
5. Stair-stepped fields on a slope.
6. Farms and ranches last only a few years here.
12. Alternating crops to revitalize the soil.
15. Allowing cattle to eat too much vegetation.
16. These absorb water and anchor topsoil.

### DOWN

2. Planting alternate rows of shallow-rooted and deep-rooted crops.
3. Most powerful agent of erosion.
4. Tilling soil across a slope, rather than up and down it.
7. Grassy plains of Africa.
8. Social insects that eat plant and wood fiber.
9. Plants that protect soil from erosion.
10. Agent of erosion, most effective in dry times.
11. Rows of tall trees planted to prevent wind erosion.
13. Most fertile layer of soil.
14. Absorbed with water into roots of plants.

# S.O.S...VOCABULARY REVIEW

## Answer Key


1 EROSION
2 STRIPCROPPING
3 WATER
4 CONTOURPLOWING
5 TERRACES
6 TROPICALRAINFOREST
7 SAVANNA
8 TERMITES
9 GROUNDCOVER
10 WIND
11 WINDBREAKS
12 CROPROTATION
13 TOPSOIL
14 NUTRIENTS
15 OVERGRAZING
16 ROOTS

### ACROSS

1. Natural process of topsoil removal. (erosion)
5. Stair-stepped fields on a slope. (terraces)
6. Farms and ranches last only a few years here. (tropical rainforest)
12. Alternating crops to revitalize the soil. (crop rotation)
15. Allowing cattle to eat too much vegetation. (overgrazing)
16. These absorb water and anchor topsoil. (roots)

### DOWN

2. Planting alternate rows of shallow-rooted and deep-rooted crops. (strip-cropping)
3. Most powerful agent of erosion. (water)
4. Tilling soil across a slope, rather than up and down it. (contour plowing)
7. Grassy plains of Africa. (savannah)
8. Social insects that eat plant and wood fiber. (termites)
9. Plants that protect soil from erosion. (groundcover)
10. Agent of erosion, most effective in dry times. (wind)
11. Rows of tall trees planted to prevent wind erosion. (windbreaks)
13. Most fertile layer of soil. (topsoil)
14. Absorbed with water into roots of plants. (nutrients)

# LANGUAGE ARTS AND AFRICA

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will be write in several modes about issues related to African rainforest and savannnah.

Social Studies CCG's: 6.1, 6.2, 7.3, 7.4, 8.1.

### MATERIALS:

- Copies of the Language Arts and Africa Directions.
- writing paper
- pencils/pens
- art supplies-construction paper, felt pens, scissors, glue, etc.

### ACTIVITY DIRECTIONS:

- Have students select one or more of the writing activities to complete.
- Students should brainstorm ideas, make a rough draft, revise the rough draft, edit the draft, and create a final product.
- have students determine the appropriate method to share their writing:share with another student/class, mail a letter or brochure, display on a bulletin board, etc.

### ADRESSES OF EMBASSYS OF AFRICAN RAINFOREST AND SAVANNAH COUNTRIES

**ZAIRE**
1800 New Hampshire Avenue, NW
Washington, DC 20008

**TANZANIA**
2139 R Street, NW
Washington, DC 20008

**UGANDA**
5909 16th Street, NW
Washington, DC 20011

**IVORY COAST**
2424 Massachusetts Avenue, NW
Washington, DC 20008

**KENYA**
2249 R Street, NW
Washington, DC 20008

**MOZAMBIQUE**
2914 R Street, NW
Washington, DC 20008

**GHANA**
2460 16th Street, NW
Washington, DC 20009

# LANGUAGE ARTS AND AFRICA

## WRITE A LETTER TO AN AFRICAN EMBASSY

Write a business letter to a consulate or embassy requesting information about an African country located in the Rainforest or Savannah Region that you plan to research and write a report on.

Your letter should contain the following:

- The purpose of your letter stated clearly
- The specific items that you would like information about such as climate, landforms, government, people, food, clothing, customs, religion, lifestyle, education, etc.
- A thank you for the information requested.

Locate the address of the embassy and mail them your request. Once you have received the information use it to write a report and share the final project with your classmates.

## DESIGN A TRAVEL BROCHURE

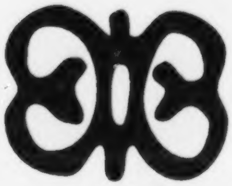
Study information about an African country of the Rainforest or Savannah Region and design a travel brochure.

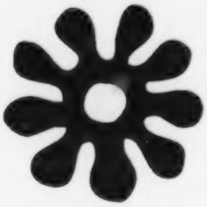
A. Look at real travel brochures to see what they are like and what information is included in them.

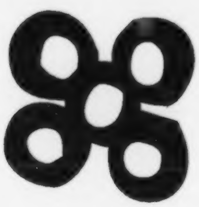
B. Include the following information in descriptive paragraph form:
   1. location of major cities and towns;
   2. climate;
   3. landforms;
   4. tourist information (money system, shopping, language, transportation, resorts, restaurants);
   5. points of interest;
   6. miscellaneous (customs, traditions, sports, food, festivals)

C. Arrange your brochure to be interesting and pleasant to look at. Be sure to include drawings and maps, or use pictures from magazines to enhance your brochure.

D. Neatness is very important. Share your final copy with classmates and send a copy to the African Embassy of your country.







# GLOBAL WARMING

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will demonstrate

- comprehension of basic greenhouse effect dynamics and terminology.
- knowledge of sources of atmospheric CO2, and of natural mechanisms that remove it.

CONCEPTS: 1.1-1.4, 1.6-1.8, 1.10, 1.11, 1.14, 1.19, 1.23

PROCESSES: 2.12, 2.14, 2.15

### VOCABULARY:

- butane
- carbon dioxide
- climate
- coal
- diesel
- fossil fuels
- greenhouse effect
- kerosene
- natural gas
- oil
- oxygen
- photosynthesis
- petroleum
- propane

### MATERIALS:

"Global Warming" student texts, "Global Warming Vocabulary" activity sheets; samples of various fossil fuels or their derivative products.

### ACTIVITY DIRECTIONS:

1. Begin by introducing vocabulary terms at left, preferably showing students samples of fossil fuels as well. Discuss each term's meaning briefly.
2. Read "Global Warming" aloud together as a class, or form small groups and allow students to take turns reading aloud through the selection.
3. In small groups, have students take turns explaining the meaning of vocabulary terms to the satisfaction of the group members, until all have been defined within every group.
4. Now assign each group one of the following four topics .
   A. sources of atmospheric CO2.
   B. natural means of removing atmospheric CO2.
   C. probable consequences of continued global warming.
   D. what needs to happen to slow and/or stop CO2 levels from rising .

Then give the groups a few minutes to reflect on their reading, discuss together, and briefly present their knowledge on their topic to the class aloud.

5. Assign the "Global Warming Vocabulary" activity.

## ENRICHMENT:

Divide your class into seven teams, assigned to the seven different continents. More teams can be created by including major island nations such as New Zealand, Japan, Madagascar or others as separate subjects, and groups can be smaller. Assign each group the following task

1. Create an elevation map of your land mass, with lines of latitude, longitude, major political boundaries and major cities included and labeled.
2. Research predictions related to the greenhouse effect, especially focussing on rising sea levels.
3. Create an elevation map for the year 2050 of your land mass, assuming a ten foot rise in sea level. Prepare a report on lowland losses. How much land was lost? What kind of land? What human activities went on there? How many people depended on that land for habitat?

## GLOBAL WARMING

The earth's atmosphere is getting warmer. Many scientists believe that average annual temperatures will slowly climb, by 3 degrees Celsius or more, over a 50 year period. While that doesn't sound like much, many scientific studies predict melting of polar ice caps, a rising sea level and major climatic changes in much of the world. Carbon dioxide is the main cause of this warming.

Carbon dioxide, or CO2, is an invisible, tasteless, odorless gas. Dry ice is frozen CO2. The bubbly gas in soda is CO2. And we exhale a good deal of CO2 in a lifetime of breathing. CO2 is a small, natural, essential part of our atmosphere (less than 1%). Yet CO2 holds the heat energy from sunlight longer than nitrogen or oxygen, the two gasses which make up most of our air. As the amount of CO2 increases, so does our atmosphere's ability to hold heat, like a greenhouse. This is why CO2's role in global warming is referred to as the greenhouse effect.

Most of the excess CO2 comes from our factories and cars, which together burn over 5 billion tons of fossil fuels each year. Fossil fuels are ancient substances formed over millions of years beneath the ground, from partially decomposed plant or animal matter. Coal, oil (petroleum) and natural gas (methane) are all fossil fuels, and others are made from oil, such as home heating oil, diesel, gasoline, kerosene, butane and propane. All of these release CO2 when burned, and other forms of air pollution as well.

Green plants absorb CO2 and use it in photosynthesis (food-making). They give off oxygen as a waste gas, which animals use to release energy from their food. Animals give off CO2 as a waste gas, plants absorb it, and the cycle continues. Much CO2 is absorbed by oceanic phytoplankton—the billions of tiny green plants growing in the world's oceans. Forests can also absorb huge amounts of CO2 as they grow. Yet when a forest burns, great amounts of CO2 are released into the atmosphere. At the same time, we have one less forest to absorb excess CO2.

More and more people are clearing tropical rainforests to make cattle ranches and farms. Valuable trees are often sold as lumber, but most of the trees are burned, releasing CO2 and destroying our earth's ability to reabsorb it. Since the soils are so poor and rains are so hard, erosion is severe, and soils lose their few nutrients rapidly. So farmers and ranchers move on after only a few years, burning huge sections of rainforest and repeating this destructive cycle.

What can be done? Clearly we must do two things. We must reduce the amount of CO2 we release into the air and we must increase the earth's ability to absorb CO2. Fossil fuels must be conserved, tropical rainforests must not be burned away, and more trees and forests must be planted.

# GLOBAL WARMING VOCABULARY

## ACTIVITY DIRECTIONS:

Use the definitions below to find the terms that fit in the numbered blanks above. When completed, the boxed letters will spell an appropriate message.

**1** _ _ _ _ _ _ _

**2** _ _ _ _ _ _ _ _ _ _ _ _ _

**3** _ _ _ _ _ _ _ _ _ _

**4** _ _ _ _ _ _

**5** _ _ _ _ _ _ _ _ _ _   _ _ _ _ _ _

**6** _ _ _ _ _ _ _ _ _

**7** _ _ _ _ _ _ _ _

**8** _ _ _ _

**9** _ _ _ _ _ _ _ _

**10** _ _ _ _ _ _ _ _ _ _ _

**11** _ _ _ _ _ _ _

**12** _ _ _ _ _ _

**13** _ _ _

**14** _ _ _ _ _ _ _ _ _ _ _ _ _ _

**15** _ _ _ _ _ _ _ _   _ _ _ _ _ _ _

**16** _ _ _ _ _ _ _ _ _ _ _ _ _

**17** _ _ _ _ _ _ _ _

**18** _ _ _ _ _ _ _ _ _ _ _

CLUES

1. Long term weather pattern for a particular region.
2. The major greenhouse gas.
3. Methane's common name.
4. A fossil fuel used by trains, trucks and some cars.
5. Term that describes the trapping of heat energy by a clear structure or by carbon dioxide.
6. Crude oil.
7. The act of surviving.
8. A solid fossil fuel.
9. 78% of our air.
10. Fuels that form from the remains of dead plants and animals.
11. The movement of soil from one place to another.
12. 21% of our air.
13. Short for petroleum.
14. Food-making in green plants.
15. These are being burned to make way for farms and ranches.
16. What the greenhouse effect is causing on earth.
17. Most cars use this fossil fuel.
18. These use sunlight, water and CO2 to make their own food.

# GLOBAL WARMING VOCABULARY

## Answer Key

### ACTIVITY DIRECTIONS:

Use the definitions below to find the terms that fit in the numbered blanks above. When completed, the boxed letters will spell an appropriate message.

1 CLIMATE
2 CARBON DIOXIDE
3 NATURAL GAS
4 DIESEL
5 GREENHOUSE EFFECT
6 PETROELEUM
7 SURVIVAL
8 COAL
9 NITROGEN
10 FOSSIL FUELS
11 EROSION
12 OXYGEN

13 OIL
14 PHOTOSYNTHESIS

15 TROPICAL RAINFOREST
16 GLOBAL WARMING
17 GASOLINE
18 GREEN PLANTS

CLUES

1. Long term weather pattern for a particular region.
2. The major greenhouse gas.
3. Methane's common name.
4. A fossil fuel used by trains, trucks and some cars.
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17. Most cars use this fossil fuel.
18. These use sunlight, water and CO2 to make their own food.

# THE HEAT IS ON: CO2 V.S. AIR

## ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- read thermometers accurately.
- gather, format, graph, and interpret temperature data.
- infer cause and effect based upon data interpretation.
- comprehend that gasses have different physical and chemical properties, among these, heat retention.
- comprehend the greenhouse effect as a concept.

CONCEPTS: 1.1, 1.2, 1.4, 1.7, 1.11-1.14, 1.19, 1.22
PROCESSES: 2.1-2.3, 2.5, 2.11, 2.12, 2.14, 2.15

## VOCABULARY:

- carbon dioxide
- Celsius
- Farenheit
- greenhouse effect
- thermometer.

## MATERIALS:

(for each group of 4-5 students) 2 wide-mouthed glass or clear plastic gallon jars with lids; 2 thermometers that will fit in the jars easily; several ounces of baking soda; 300-400 mL of vinegar; matches; 500 mL beaker or cup of nearly the same size; a sunny day; plastic overhead transparency graph grid; erasable marker; overhead projector.

## ACTIVITY DIRECTIONS:

1. Students should take one jar and tape a thermometer to its inner wall, facing outward, and easily read. Close the lid. This is the "air sample".
2. Repeat the above procedure for the second jar. Then add baking soda and shake gently to spread it evenly across the bottom of the jar.
3. Next, pour the vinegar in...it will react with the baking soda. Immediately have students keep a lit match or small candle directly in the jar's neck, where the lid seals. As more CO2 is produced in the jar, it will rise, pushing out (displacing) the less dense air. Matches or candles won't stay lit when the jar is full of CO2, for lack of oxygen. Once full, secure the lids on these "CO2 samples."
4. Explain to your students that they will expose the jars to direct sunlight and record their interior temperatures every 60 seconds until neither jar's temperature will increase further. Then they will quickly move both jars to shade and continue recording temperatures until you run out of time or until readings fail to decrease at all for five consecutive minutes.
5. Discuss possible data collection formats. Model, or let students demonstrate some ways of organizing this data. Allow students time to prepare their data sheets. Have them write predictions, stating reasons for them.
6. Afterward, have students graph their results, either independently, or with your guidance, modeling at the overhead projector.

## DISCUSSION:

Invite students to display their graphs and interpret them for the class at the overhead. Encourage them to make inferences regarding cause and effect, and to use data to support their ideas. Discuss predictions v.s. outcomes. Have students explain the reasoning behind their conclusions.

## BACKGROUND:

Over numerous trials of this experiment, CO2 jars stayed warm longer, by only a few degrees Celsius, which is nonetheless significant. They cooled more slowly, holding constant temperatures longer than the "air samples."

## ENRICHMENT:

Test the effect of increased exposure to CO2 on green plants. Keeping all other conditions equal, maintain a dozen bean seedlings in open air, and another dozen in a relatively air-tight glass or plexiglass "mini-greenhouse." Rent a CO2 cannister and release an atmosphere of CO2 into the greenhouse every hour throughout each school day. After school, flush the CO2 out for the night. Have the students record daily observations and discuss them.

# CO2 AND YOU

## ACTIVITY OBJECTIVES:

Students will demonstrate the ability to..

- identify fossil fuels and their applications.
- appreciate our overwhelming dependence on fossil fuels.
- change their behavior to conserve fossil
- fuels and reduce CO2 emissions and waste.

CONCEPTS: 1.1-1.4, 1.7, 1.10-1.14
PROCESSES: 2.1-2.3, 2.5, 2.6, 2.8, 2.12, 2.15

## VOCABULARY:

- coal
- conservation
- natural gas
- petroleum
- synthetic

## MATERIALS:

- paper
- pencils

## ACTIVITY DIRECTIONS:

**1.** Introduce the vocabulary words and discuss. You and your students can reduce CO2 levels by increasing the earth's ability to absorb it. So plant some trees! Get permission to plant trees on the school grounds, or in a nearby park. Call your local parks department or a conservation-related organization (list to follow) and ask about community greening projects. Perhaps your class can participate in volunteer efforts to plant trees and restore natural habitat in your community.

**2.** You and your students can reduce CO2 levels by reducing fossil fuel consumption.

A. Hold a contest to see which student can list the greatest number of things in his or her home that either use fossil fuels, or fossil fuels were used in their production, or fossil fuels were used in their distribution. Don't clarify much or give away answers, but allow students to ask anyone else for help.

B. The next day, cover several of the longest student lists, reading items aloud and having students describe the connection to fossil fuels.

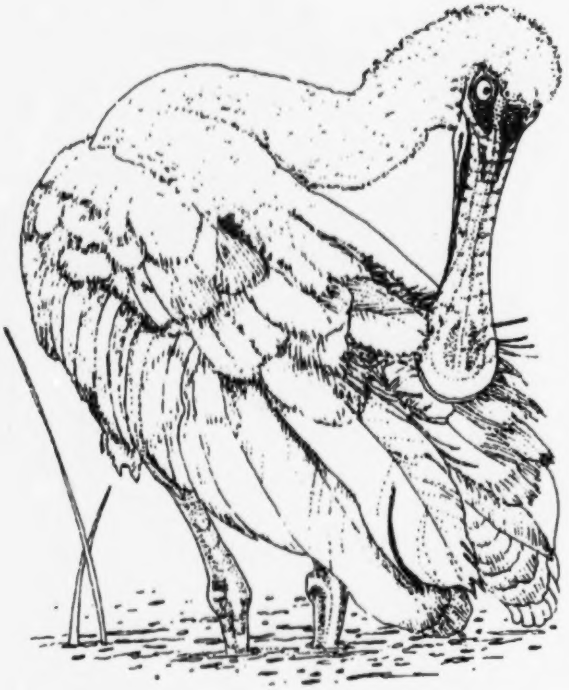
C. Now share the "Background" information with your students. It is divided into materials and fuel-using devices most commonly observed in and around a home. As you discuss each category, write it on the board, have students copy it on paper, and brainstorm together new ideas for fossil fuel-dependent items in the home.

D. Clearly, nearly all of our materials are dependent on fossil fuel use. We are hooked! Since students' lists would be incredibly long now, hold a new contest to see who can find the most household things that DON'T depend on fossil fuel use at all.

E. The next day, discuss these lists, which will be short, and prove together that each item is free of fossil fuel dependence.

## ENRICHMENT: HOW TO CONSERVE FOSSIL FUEL ENERGY

1. Teach energy conservation. (Electricity, heating, cars, mass transportation, bicycles, walking) Almost anything bought and/or wasted needlessly consumes fossil fuels and releases CO2.
2. Food waste wastes fossil fuels and adds CO2 to the atmosphere. Have your students develop and implement a plan to reduce and compost school food waste. Have them design compost systems for use at home and encourage parents to let them build and manage it. It's very easy.
3. Recycle. Recycling saves landfill space and prevents the waste of reusable, limited-supply materials. But each recyclable item also represents a lot of energy spent in its manufacture; recycling saves energy and reduces CO2 emissions.
4. "Research and Design" teams of students can plan the most easily-managed and efficient recycling systems for school and home as an assignment, discussing pros and cons and honing their products. Adopt one and implement it. In the classroom, and school-wide. Encourage parents to allow students to create and manage home recycling centers. Measure garbage volume prior to and after recycling begins to determine how much material has been saved from expensive transport and burial at a landfill.



5. Contact one or several of these organizations for more information on available curriculum materials, guest speakers, teacher resources and field trip opportunities. All are in or near Portland.

Arbor Society
Friends of Trees
World Forestry Center
Northwest Steelheaders Association
Portland Bureau of Parks and Recreation
Metro Recycling
Northwest Association of Marine Educators (NAME)
Portland General Electric
Trojan Nuclear Facility (PGE)
Bonneville Dam (PGE)
John Innskeep Environmental Learning Center
(Clackamas Community College)
Sunflower Recycling Cooperative
Portland Audubon Society
Waste Management of Oregon
Northwest Natural Gas
Oregon DEQ

# BACKGROUND:

## GENERAL CATEGORIES OF HOUSEHOLD FOSSIL FUEL DEPENDENCE

1. Actual fuel consumption: cars, stoves, furnaces, mowers, etc.
2. Lubricants, paints, house or yard chemicals: often oil-based and require energy to manufacture.
3. Metals and glass: tremendous energy to manufacture.
4. Wood and paper products: harvest, milling both energy-intensive.
5. Plastics, synthetic rubber: petroleum-based and energy intensive in manufacture.
6. Other mineral products: gypsum sheetrock, concrete, gravel, plaster, tile, brick, sand, etc: mining and manufacture both energy-intensive.
7. Food: farm machinery uses fossil fuels, agro-chemicals are energy-intensive in manufacture, food-processing industry energy-intensive.
8. Medicines, cosmetics: some are fossil-fuel based, all energy-intensive in manufacture.
9. Fabrics: natural fibers farmed or ranched. (eg—cotton, wool) energy-intensive as described in "food" above; synthetic fibers are petroleum-based and energy-intensive in manufacture.
10. Electricity: used in nearly all homes and manufacturing, and usually generated by coal or oil fired generators; but even nuclear plants, hydroelectric dams, geothermal and solar plants require heavy fossil fuel use in their own construction.
11. Transportation: Of anyone, or anything listed above, by air, water, rail or road, fossil fuels are nearly always burned for energy, and in the manufacture of planes, ships, trains, trucks and cars.

# SUSTAINED USE.... LIVING WITH THE TROPICAL RAINFOREST

## Teacher Information

### ACTIVITY OBJECTIVES:

Students will demonstrate the ability to

- understand concepts of land productivity, intensive v.s. extensive cultivation, and sustained use.
- understand that tropical rainforest is most productive for people as a living forest, and least productive for people as extensive farms or cattle ranches.
- understand the concepts of agroforestry and aquaculture.

CONCEPTS: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.10, 1.11, 1.12, 1.13, 1.14, 1.23
PROCESSES: 2.3, 2.6, 2.12, 2.15

### VOCABULARY:

- agroforestry
- aquaculture
- extensive
- ferment
- hectare
- intensive
- nitrogen-fixer
- productivity
- protein
- succession
- sustained use

### MATERIALS:

"Sustained Use...Living With The Tropical Rainforest" student texts, "Sustained Use Wordfind" activity.

### ACTIVITY DIRECTIONS:

1. Introduce and discuss vocabulary with your students.
2. Read together aloud "Sustained Use...Living With The Tropical Rainforest", pausing for discussion as appropriate.
3. Use the "Sustained Use Wordfind" as a vocabulary review assignment.

### ENRICHMENT:

1. Have your students write letters of inquiry to organizations dedicated to research and development of sustained use economy in tropical rainforests. Find out who is doing what where, and with what successes, failures, obstacles, or support. Have each student report to the class on one organization and discuss each one in terms of promise and successes. Adopt one or several as a concern worthy of advancement and dedicate fund-raising activities to support it. Recycling proceeds are a good way to raise money.
2. Encourage students at school/home to set up comprehensive recycling centers and estimate the dollars saved in garbage dumping fees, and contribute that amount to the adopted cause.

## SUSTAINED USE...LIVING WITH THE TROPICAL RAINFOREST

It is clear that the destruction of tropical rainforests hurts everyone. Global warming, mass extinctions of species, flooding and devastation of coastal areas must all be prevented. Yet the peoples of the tropical rainforests must earn a decent living without destroying their environment. If clearcutting, cattle ranching and large-scale farming destroy the land, alternatives must be available to convince people to abandon these methods. Fortunately such alternatives do exist. They are called "sustained use" strategies because they can be practiced without ruining or abandoning land. And more strategies are being developed all the time as we learn more about these lands.

If you cleared one hectare (2.47 acres) of tropical rainforest, planted grasses and raised cattle, you would likely produce nine pounds of beef per year, and only for several years. Then the soil would be exhausted and eroded. Compare this beef productivity to the possibilities offered by these tropical "superplants:"

- The giant wax gourd of Asia. It grows up to 2.5 centimeters every 3 hours, produces 4 crops per year, weighs 77 lbs and is 6.5 feet long at maturity, is edible throughout its life, and stores for a year without spoiling, even in the tropics.
- Spirulina blue-green algae. 60-70% of it is protein by weight, it grows in nearly any fresh water, and one hectare can yield 187 lbs per day.
- Leucaena leucocephala (a tree). It grows fast, provides huge amounts of wood for fuel, pulp and timber, animal fodder from its leaves, and its pods, seeds and young leaves are edible to humans. Planted in garden plots, it protects crops and soil from hard rain, wind, drying and erosion, and its roots fix nitrogen in the soil.
- Petroleum Nut Trees. 6 of these can produce 70 gallons of oil, used for cooking fuel instead of wood. A tree that saves trees!
- Ipilipil Trees. 1200 acres of these yield one million barrels of crude oil!
- Babacu Palm. It yields oil, animal fodder, fertilizer, flour, charcoal, alcohol, tar, and 1,000 lbs of fruit per year. It grows well in heavily disturbed tropical rainforest soils!
- Bamboo. It thrives in poor soils and provides useful building materials.

Cattle ranches and large farms are created by settlers on tropical rainforest land. They are "extensive"land uses because so much land is needed to produce so little. And they don't work. "Intensive" land use means high productivity in a small area of land. Agroforestry is an example of intensive, sustained land use. Here's how it works.

The main idea behind agroforestry is that the forest is the most productive use of land possible. It already grows more pounds of plants and animals than any other land practice could under such conditions. The key is to copy the stages of forest growth using plants and animals most useful to people. Natural forest succession begins with herbs and other small plants. Later, shrubs and small trees grow, and finally, large primary trees create a canopy. Understory species then grow in the canopy's shade.

Agroforesters copy this succession, growing farm crops on cleared land, such as maize, sweet potato, pineapple, lima beans. These crops are grown between seedlings of larger trees and shrubs. After a few years, papaya, banana, cashew and other small fruit trees mature, yielding fruit and shading out the smaller crops. Eventually even these trees are shaded out by the larger trees, which are often chosen for their timber, medicinal, or food-producing value. Once the canopy is established, understory crops are grown and harvested, such as cacao, rubber and others. In many cases, 14 to 21 years of forest growth on the farmed soil is enough to re-enrich the soil, and the cycle may be repeated.

Animals also play a large role. Huge numbers of herbivores can live in the tropical rainforest because they don't all eat the same plants. Native animals and domesticated animals can live on a forest farm in great numbers if they are managed properly. Pigs, chickens, ducks, fish, tapirs, deer, iguanas, crocodiles, banteng, capybaras and many other animals may feed on the living forest. Cattle can't.

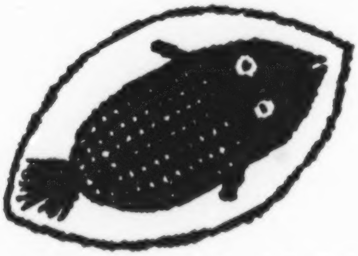
The Lacandon Indians of Mexico grow over 80 food or material crops on one hectare of land. From nearby forests they gather 100 varieties of wild fruit, 20 species of fish, 6 species of turtle, 3 of frog, 2 of crocodile, 2 of crab, 3 of crayfish, 2 of snail, and so on. A Lacandon "milpa" garden covers one-half hectare and lasts 5 to 7 years before secondary vegetation overgrows it. It will be fertile again in less than 20 years, and will attract wildlife because of the surviving food-producing plants. The milpa will yield 550 lbs of corn and 550 lbs of root and tree crops per year. Half a hectare of cattle ranch yields less than 5 lbs of beef. Lacandon land is kept fertile with leaf litter and manure from the trees and animals. It returns to forest without the terrible erosion seen on cattle land. And milpas are not highly productive or long-lived compared to other intensive methods.

Aquaculture (fish farming) has been very successful in tropical rainforests. People dig clay-based fish ponds, fill them with water and grow algae in the water. The tilapia fish eats algae, thrives in such pondwater, and is 35% protein by weight, compared to beef's 23% Fish are harvested every 15 weeks, and much of it is sold for badly needed cash. Fish ponds encourage farmers to settle and work small amounts of land intensively. This greatly slows the destruction of forest. And the people have a good supply of high protein food.

Intensive aquaculture is being practiced in Zaire, Togo, Thailand, China, India and the Philippines. One highly productive model works like this: The tilapia fish are fed termites and algae, a high protein, nutritious diet. Pig and chicken pens with grated floors are built over the pond, so that animal wastes fall in the water. This fertilizes the algae, which grows rapidly. The pigs and chickens are fed food wastes and crop stubble, but farmers sometimes buy feed grain as well. Because their fish, pork and poultry bring higher prices than grains do, they can afford to invest in good feed. Extra manure is mixed with water in large, sealed vats. This mixture produces natural gas, which is used to power generators that supply electricity for light, refrigeration and other uses. When the mixture stops producing gas, leftover solid sludge is used as field fertilizer. The liquid "caldo" is used to grow a protein-rich algae that is fed back to the pigs and chickens.

The edge of a pond is moist all year because water percolates through the soil. Gardens grow well here, with nutrient-rich pondwater only a few feet away. Small crops are planted near the edge, with tree crops farther back, such as papaya, banana and cashew. Imagine the productivity of a hectare of rainforest that included the intensive aquaculture described above and the planting strategies and animal husbandry of intensive agroforestry! Such a plot would yield thousands of pounds of fish per year, not to mention pork, poultry, fruits, vegetables and many of the other plant and animal products of agroforestry. This, or 9 lbs of beef and a hectare of ruined land.

The key is to make intensive sustained use possible for people. Loans are needed to get people started. The first two years typically lose money, but after that the land more than pays for itself. In fact, intensive sustained use farmers are far more prosperous than ranchers or extensive farmers. Education is also needed. When trained specialists teach farmers to do this and help them to success, other farmers will naturally be curious. Perhaps we could learn something valuable from intensive sustained use, too.



# SUSTAINED USE WORDFIND

## ACTIVITY DIRECTIONS:

Locate and circle each of the terms listed below. Then write each term and its definition on the back of this sheet.

E X T E N S I V E L A N D U S E Y P A I
T R I E N S C S E E D E N A D S M E N U
S S M D R N E H E C T A R E I T A S I S
E U B S T M Y T I V I T C U D O R P M E
R R E H O E I R T Y A N R T M S D I A S
O G R E O E C T N A D K P N T I F R L U
F N R E X I F N E G O R T I N I E U H D
N A A D N T D P S S O O G S N S G L U N
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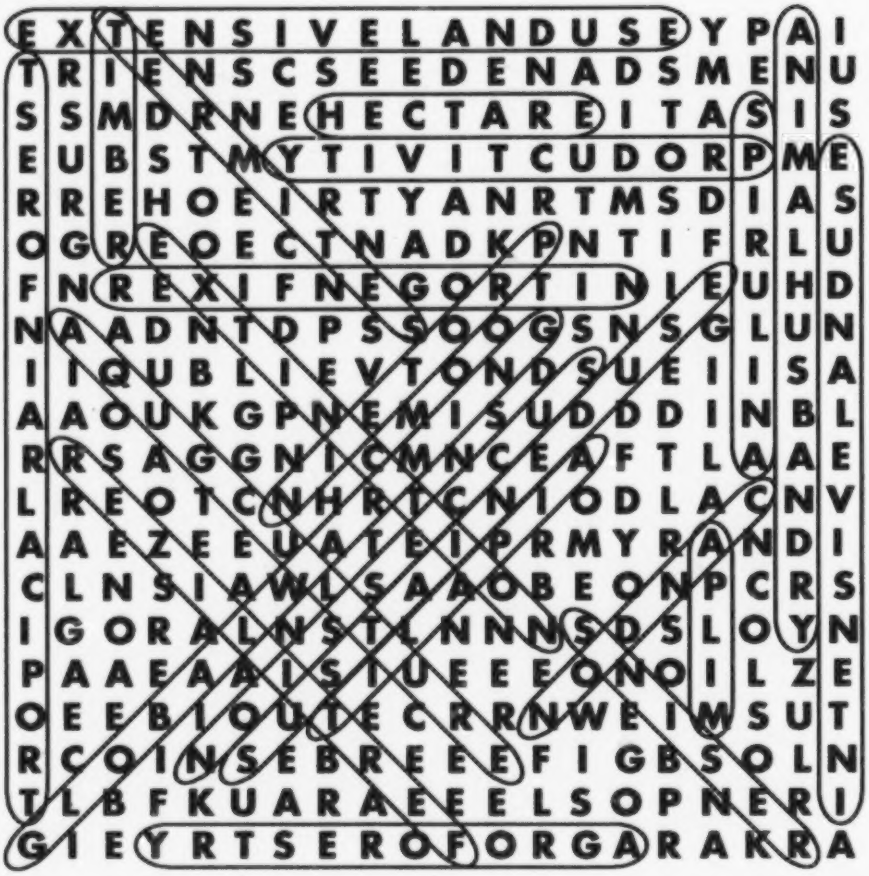
A A O U K G P N E M I S U D D D I N B L
R R S A G G N I C M N C E A F T L A A E
L R E O T C N H R T C N I O D L A C N V
A A E Z E E U A T E I P R M Y R A N D I
C L N S I A W L S A A O B E O N P C R S
I G O R A L N S T L N N N S D S L O Y N
P A A E A A I S I U E E E O N O I L Z E
O E E B I O U T E C R R N W E I M S U T
R C O I N S E B R E E E F I G B S O L N
T L B F K U A R A E E E L S O P N E R I
G I E Y R T S E R O F O R G A R A K R A

### TERMS

EXTENSIVE LAND USE
NITROGEN-FIXER
EXTINCTION
TROPICAL RAINFOREST
FIBERS
ANIMAL HUSBANDRY
GLOBAL WARMING
TILAPIA
AQUACULTURE
HECTARE
CALDO
RESINS
ALGAE
MILPA
INTENSIVE LAND USE
SUSTAINED USE
LACANDON
PRODUCTIVITY
AGROFORESTRY
TERMITES
TIMBER
SPIRULINA
PROTEIN
SUCCESSION
FERTILIZER

## SUSTAINED USE WORDFIND

### Answer Key



E X T E N S I V E L A N D U S E Y P A I
T R I E N S C S E E D E N A D S M E N U
S S M D R N E H E C T A R E I T A S I S
E U B S T M Y T I V I T C U D O R P M E
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O G R E O E C T N A D K P N T I F R L U
F N R E X I F N E G O R T I N I E U H D
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A A O U K G P N E M I S U D D D I N B L
R R S A G G N I C M N C E A F T L A A E
L R E O T C N H R T C N I O D L A C N V
A A E Z E E U A T E I P R M Y R A N D I
C L N S I A W L S A A O B E O N P C R S
I G O R A L N S T L N N N S D S L O Y N
P A A E A A I S T U E E E O N O I L Z E
O E E B I O U T E C R R N W E I W S U T
R C O I N S E B R E E E F I G B S O L N
T L B F K U A R A E E E L S O P N E R I
G I E Y R T S E R O F O R G A R A K R A

**TERMS**

EXTENSIVE LAND USE
NITROGEN-FIXER
EXTINCTION
TROPICAL RAINFOREST
FIBERS
ANIMAL HUSBANDRY
GLOBAL WARMING
TILAPIA
AQUACULTURE
HECTARE
CALDO
RESINS
ALGAE
MILPA
INTENSIVE LAND USE
SUSTAINED USE
LACANDON
PRODUCTIVITY
AGROFORESTRY
TERMITES
TIMBER
SPIRULINA
PROTEIN
SUCCESSION
FERTILIZER

# WHY WE SHOULD CARE NOW FOR THE FUTURE OF LIFE

**Social Studies CCG's:** 6.1, 6.2, 7.3, 7.4, 8.1.

## WEATHER

- Many scientists believe that weather patterns could be drastically changed by the destruction of tropical rainforests. The rainforest plants help purify the air.

## DIVERSITY

- More than 50% of all plant and animal species in the world are found in the rainforests of the world. These plants and animals are being destroyed along with the rainforests, and the loss of this species diversity would have serious consequences for our earth's environment.

## PRODUCTS AND MEDICINES

- Some species of plants and animals that could potentially provide people with new products and medicines can be found in the rainforests.

## BEAUTY AND INSPIRATION

- Tropical rainforests provide a rich and beautiful array of animals and plants that have long inspired artists, scientists, and others.

## CULTURAL PRESERVATION

- As the rainforests are lost, so are the cultural traditions of the native people of these regions. These people have the right to live where and how they want.

## NATIVE KNOWLEDGE

- As native people die or are forced to move, the world will lose their great knowledge of the rainforest plants and animals, and their uses as medicines and other products.

## ECONOMICS

- People all over the world depend on products from the rainforest for everyday living. The scarcity of these products due to rainforest destruction, will make these products more expensive.

## ECOLOGY

- The loss of thousands of acres of rainforests causes immediate ecological problems such as soil erosion and water pollution, which will only increase in severity as more forests are destroyed.

**Everyone must become aware of the problems in the rainforest and how they affect us in our daily lives. Write to organizations listed in the resource section of this packet to find out more about how you can "Care now for the future of life."**

# AFRICA: SCIENCE

## Correlation to the Oregon Common Curriculum Goals

(Oregon Department of Education CCG's, Science, Spring 1989)

The Science Common Curriculum Goals are organized into 7 strands withn the major areas as shown below:

### 1.0 CONCEPTS

1.1 Cause and Effect
1.2 Change
1.3 Cycle
1.4 Energy-Matter
1.5 Organism
1.6 Population
1.7 Equilibrium
1.8 Evolution
1.9 Force
1.10 Fundamental Entities
1.11 Interaction
1.12 Order
1.13 Quantification
1.14 System
1.15 Theory
1.16 Field
1.17 Gradient
1.18 Invariance
1.19 Model
1.20 Perception
1.21 Probability
1.22 Replication
1.23 Scale
1.24 Symmetry
1.25 Time-Space

### 2.0 PROCESSES

2.1 Observe
2.2 Measure
2.3 Use Numbers
2.4 Relate Time-Space
2.5 Infer
2.6 Classify
2.7 Define Operationally
2.8 Question
2.9 Hypothesize
2.10 Design Experiments
2.11 Control Variables
2.12 Interpret Data
2.13 Predict
2.14 Formulate Models
2.15 Communicate

### 3.0 MANIPULATIVE SKILLS

### 4.0 INTERESTS

### 5.0 VALUES

### 6.0 INTERACTIONS

### 7.0 CHARACTERISTICS

In the interest of brevity and utility, only the concepts and processes broadly addressed in each unit are referenced below:

### THE LAY OF THE LAND

1.6, 1.10, 1.13, 2.3, 2.6, 2.12, 2.15

### HOME SWEET HOME

1.1, 1.2, 1.3, 1.5, 1.6, 1.19, 2.1, 2.2, 2.3, 2.5, 2.6, 2.9, 2.11, 2.12, 2.13, 2.14, 2.15

### A DIVERSE CAST OF PLAYERS

1.5, 1.6, 1.10, 2.6

### GET A LIFE!

1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.12, 1.13, 1.14, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15

### Caring Now For The Future of Life

1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.11, 1.12, 1.13, 1.14, 1.15, 1.17, 1.19, 1.23, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9, 2.11, 2.12, 2.13, 2.14, 2.15

# AFRICA: SOCIAL STUDIES

## Correlation to the Oregon Common Curriculum Goals

(Oregon Department of Education CCG's, Social Studies, Spring 1990)

The Social Studies Common Curriculum Goals are organized into 10 strands withn the major areas as shown below:

### KNOWLEDGE

1.0 Economic Understandings
2.0 Political Understandings
3.0 Geographic Understandings
4.0 Historical Understandings
5.0 Cultural Understandings

### SKILLS

6.0 Communication and Study Skills
7.0 Thinking/Decision-making Skills
8.0 Interpersonal/Participation Skills

### DEMOCRATIC PARTICIPATION (LIMITED TO THE UNITED STATES)

9.0 Constitutional/Democratic Heritage
10.0 Civic Values and Responsibilitites

Strands 1.0-7.0 are addressed in the Africa activities as listed below:

| UNIT | COMMON CURRICULUM GOALS |
|---|---|
| **LAY OF THE LAND** | 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 7.5, 8.1. |
| **HOME SWEET HOME** | 3.5, 6.1, 6.3, 6.4, 6.5, 7.1, 7.3, 7.4, 7.5, 8.1. |
| **A DIVERSE CAST OF PLAYERS** | 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 4.2, 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, 8.1. |
| **GET A LIFE!** | 1.1, 1.2, 1.4, 1.6, 3.3, 3.4, 6.1, 7.3, 7.4, 8.1. |
| **CARING NOW FOR THE FUTURE OF LIFE** | 6.1, 6.2, 7.3, 7.4, 8.1. |

# AFRICA: GLOSSARY

## A
abiotic substances • basic inorganic and organic compounds of the environment
abuse • the misuse of someone or something, bringing harm.
adaptation • body part or behavior that helps a plant or animal survive
agroforestry • "farming" a forest without destroying it
alate • winged insect expecially bred to be future king or queen
amphibian • a phylum of cold-blooded, mostly egg-laying, moist-skinned vertebrates that must return to water to reproduce
aquaculture • raising fish in ponds intensively.
area • the amount of surface within a given set of limits, especially as measured in square units
arid climate • having little rainfall
autotrophic • the ability of an organism to make its own food; self-nour-ishing (plants)
average rainfall • rainfall averaged over a year
aviary • a large enclosure for birds

## B
bacteria • single-celled germs
barter • to trade without using money (goods/services for other goods/services)
biome • the largest ecological unit, comprising all the many kinds of plants and animals occupying a broad region of the earth
bird • a phylum of warm-blooded, egg-laying, feathered vertebrates
bivouac • a temporary camp or shelter
bromeliads • mostly epiphytes...hanging plants that store water
browse • to feed on leaves, twigs and other plant parts
browser • any animal that browses for food
butane • a fuel gas obtained from petroleum
buttress roots • tall, ridge-shaped roots that extend far from emergent tree trunks for support.

## C
cacao • understory tree whose bean is used to make chocolate
camouflage • the color and form of an animal that helps it in blending with its customary background
canopy • layer of tropical rainforest made of treetops
capital accumulation • to amass or colect money or materials of value
carbon dioxide • an invisible gas released by burning wood or fossil fuels
carnivore-a meat • eating animal
carrion • the remains of dead animals
cash crops • crops that are sold
cellulose • carbohydrate that plant and wood fibers are made of
Celsius • name of a commonly used temperature scale (0-100)
channel • the deepest part of a river, harbor, or other waterway
classification • the description, naming, and grouping into categories f all animals and plants according to their similarities and relationships
climate • long-term weather pattern for a particular place or region
coal • a brown-to-black fossil fuel formed from partly decomposed plant matter over millions of years underground

commensalism • a symbiotic relationship in which one species benefits without harming or helping the other species
competition • living things with one another for enough resources to live
conservation • to use resources wisely and avoid waste and destruction
consumer • organisms, largely animals, that eat other organisms or or-ganic matter
contour plowing • plowing across a slope instead of up and down it, to prevent erosion.
crop rotation • changing crops regularly to re-enrich the soil
crown • the upper growth of a tree

**D**
database • information from which conclusions can be drawn (facts and figures)
decompose • to rot or decay
decomposer • organisms, largely bacteria and fungi, that break down the complex compounds of dead plants and animals.
decomposition • rotting, or decaying
demographic • information that describes a population
desert • a dry area where few plants growdiesel-a liquid fuel obtained from petroleum
desert shrub • small woody plants that grow near the ground within a desert climate
diversity • a wide variety
drought • a prolonged period without normal rainfall

**E**
ecology • the study of the relationship between living things and their non-living environment
economy • the structure of economic life in a country , area, or period
ecosystem • a community of living things and its environment
elevation • height above sea level
emergent • top layer of tropical rainforest...the tallest trees above the canopy
endangered species • in risk of becoming extinct
enzymes • proteins that assist in digestion of various foods
epiphytes • hanging plants with no true roots
Equator • 0 degrees latitude...an imaginary line encircling the Earth halfway between the North and South Poles, separating the earth into northern and southern hemispheres
erosion • the removal of soil from where it formed.
evaporation • the process of a liquid becoming a gas
exposure • to be unprotected from sun, wind, rain, etc.
extensive land use • using a lot of land to produce a small amount of food and other goods
extinction • total destruction of a species

**F**
Farenheit • name of commonly used temperature scale.(32-212)
ferment • a process in which chemicals are broken down to simpler parts
fertilize • to add nutrients to soil
fish • a phylum of cold-blooded, scaly-skinned, aquatic animals, most of which use gills to obtain oxygen in water
folktale • a timless tale often related orally
food chain • a group of organisms that make up a "chain", linked together by the relationship that each member is eaten by the next. Afood chain rarely includes more than six kinds of organisms.

food pyramid • concept that the number of organisms decreases in each succeeding stage of a pyramid, with large numbers of producers at the base of the pyramid and progressively decreasing numbers of herbivores and carnivores above

food web • all of the organisms in an ecosystem that are linked together by the relationship that members are eaten by other members and there are alternative pathways that members may take.

forage • all of the plants edible to an animal

forest floor • the dark, open, bottom layer of the tropical rainforest

fossil fuels • coal, oil and natural gas. all formed from partly decayed organic matter underground, over millions of years

fungi • non-green, plant-like organisms, including yeasts, molds, smuts and mushrooms

**G**

gasoline • a liquid fuel obtained from petroleum

germinate • to sprout

global warming • the gradual warming of the earth's atmosphere

graphic-relief • vividly described, lifelike maps of a country

grassland • land covered mainly in grasses

graze • to feed on grasses

grazer • any animal that grazes for food

greenhouse effect • the trapping of heat by carbon dioxide in our atmosphere or by any clear structure, like a greenhouse

groundcover • plant growth that holds the soil in place

gulf • a body of water forming an indentation in the shorline of an ocean or sea, usually larger and deeper than a bay

**H**

habitat • the space that provides all of an animal's needs

hectare • 2.47 acres

herbivore • an animal that eats only plants

heterotrophic • organism that gets its nourishment from eating or absorbing other organisms; it does not have the ability to make its own food

historical sketch • Brief prarograph that includes historical aspects and events of a country, state, region, or period

humidity • amount of moisture held in the air

**I**

independence • the state or quality of being independent

intensive(land use) • using a small amount of land to produce a maximum amount of food and goods

interdependence • a relationship in which two or more species depend upon one another for survival

industrialization • to set up or devlop industry

**J**

jangala-ancient Sanskrit word that means "dense plant growth"

**K**

kerosene-a liquid fuel obtained from petroleum

## L

lake • a large inland body of salt or fresh water, usually entirely surrounded byland

latitude • The distance north or south of the Equator, expressed as degrees measured from the earth's center. All points of a given latitude form a circle running east and west and parallel to the Equator.

limiting factor • anything in nature that reduces a population

locust • a flying insect that swarms in millions and eats plants

longitude • distance on the earth's surface, measured in degrees east and west of the Prime Meridian and shown on maps and globes by imaginary lines from the North Pole to the South Pole

## M

malaria • a disease spread by mosquitoes that causes fever, chills, sweating

mammals • a phylum of warm-blooded, hairy vertebrates that give live birth and nurse young with mother's milk

microhabitat • a habitat within a habitat

migrate • to move from one region to another, usually to find food

monarchs • ahereditary ruler of a state or country, such as a king or queen

moral of a story • a lesson that is learned from the events/outcomes of a story

mountain • a mass of land rising steeply to a great height above the surrounding country

mutualism • a symbiotic relationship in which both species benefit from one another

## N

nationalism • patriotic devotion to one's nation

natural gas • a fossil fuel formed by decaying organic matter

niche • the "job" an animal does in a food web

nitrogen • fixer-any plant with roots that can take nitrogen from the air and convert it into solid form, which enriches soil

nomadic • roaming, without a permanent home

nutrients • nourishment for plant or animal growth

## O

ocean • a whole body of salt water that covers nearly three-fourths of the earth's surface

oil • petroleum

omnivore • any animal that eats both plants and animals

opposable • can be closed together to grasp, like thumb and finger

organic matter • remains of plant and animal life

oxygen • the gas we breathe, and one used in burning of wood or fossil fuels; also given off by green plants

## P

parasitism • a symbiotic relationship in which one organism depends upon and harms another

pastoral • having the simplicity, peacefulness, charm and other qualities usually associated with country life

petroleum • crude oil

photosynthesis • the process of food-making in green plants

phototropism • a green plant's tendency to grow toward light

poaching • to hunt or fish illegally

pollinator • any animal that pollinates a flower

population • the number of organisms of one species in an area (people, animals, plants, etc.)

population density • the total number of people living in an area in a closely packed condition

portfolio • information, papers, drawings gathered together in a case/folder

predator • any animal that kills other animals for food
prehensile • grasping...as in prehensile tail—one that can grasp
prey • any animal hunted by a predator
primary consumer • herbivores that feed directly on living plants or plant remains
Prime Meridian • the line that passes through Greenwich, England, designated as zero degrees longitude, and from which longitude east and west is measured
producer • organisms that make their own food from simple inorganic substances; autotrophic organisms; plants
productivity • the total amount of life supported per area of habitat.
propane • a fuel obtained from petroleum; a gas
protein • a nutrient important to human survival.
protozoan • primitive, single-celled organism.
proverb • a short popular saying that expresses the truth

## R

rainforest • a dense, tropical forest in a region receiving 80 or more inches of annual rainfall
reptiles • a phylum of cold-blooded, dry and scaly skinned, egg-laying vertebrates.
resident • any animal that lives permanently in a home territory.
resources • immediate and possible sources of revenue
river • a large stream of water that flows in a natural channel and empties into a lake, ocean, or another river

## S

sahel • in Africa, a strip of dry grassland between desert and a savannnah
savannah • a broad plain containing scattered trees and grassy vegetation
scavenger • any animal that eats the remains of dead animals
secondary consumer • carnivores or omnivores that feed on the primary consumers
semiarid climate • having seasonal but little rainfall
species • any group of animals or plants that can reproduce their own kind
strip-cropping • planting alternating rows of shallow-rooted crops and deep rooted crops to prevent soil loss
subsitence • the state or condition of supporting life; continued existence
succession • a slow process by which a forest grows back in stages, from the smallest plants, to the largest
sustained use • any land use that doesn't destroy the land, and continues to be productive into the future
swamp • a shallow wetland that is constantly wet
symbiosis • a relationship between organisms in which at least one of them benefits from the other
synthetic • human-made

## T

taxonomy • the science of classification of plants and animals
termites • social insects that eat wood and other plant parts
terracing • re-shaping a hillside into a series of stair-stepped fields
tertiary consumers • the top group of organisms in a food pyramid that are not eaten by other organisms. These are sometimes called 'indicator species' because if there is some-thing wrong in the ecosystem in relation to the food pyramid, it will show up in this group first.
thermometer • instrument for measuring temperature
topography • the shape and slope of land
topsoil • the richest soil layer, just beneath plants and organic matter
Tropic of Cancer • 23 degrees, 27 minutes latitude north of the equator

Tropic of Capricorn • 23 degrees, 27 minutes latitude south of the equator
tropical • all areas located between the Tropic of Cancer and the Tropic of Capricorn
tropical climate • having the characteristics of the tropics
tropical rainforest • a low elevation, tropical forest that receives 80 or more inches of rain per year, and is wet all year
tse-tse fly • an African biting fly that drinks blood and spreads disease

**U**

understory • the low layer of shrubs and small trees in a tropical rainforest

**V**

veld • a region of open grasslands in South Africa, having scattered bushes and trees

**W**

windbreaks • rows of tall trees planted to block wind at a field's edge
woodland • land that is dominated by trees and shrubs, but may contain plants as well

# AFRICA: RESOURCES

## FILMS

Animals of the World: Africa
Biomes: Tropical Rain Forest
Brightest Africa
Castles of Clay
Elephants: Their Last Stand
Endangered Animals: Will They Survive?
Erosion
Eye On Nature: Zebras
Garbage
The Garbage Explosion
Grasslands Of The World
Jane Goodall-Studies of the Chimpanzee:
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The Life Of Plants:
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Life In The Grasslands
The Lorax
Miss Goodall and the Wild Dogs of Africa
Mzima: Portrait of a Spring
National Geographic: African Odyssey
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National Geographic:
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National Geographic:
    Baka - People Of The Forest
National Geographic: Creatures Of The Mangrove
National Geographic: Creatures Of The Namib
National Geographic: Gorilla
National Geographic: Lions Of The African Night
National Geographic: Rain Forest
National Geographic: The Rhino War
National Geographic: Search For The Great Apes
National Geographic: The Wilds Of Madagascar
The Nature of Things: The Elephant
Nature's Communities: A Tropical Rain Forest
Reducing, Reusing, And Recycling:
    Environmental Concerns
Saving The Gorilla
Silent Safari: Baboon
Silent Safari: Cheetah
Silent Safari: Elephant
Silent Safari: Gazelle
Silent Safari: Giraffe
Silent Safari: Impala
Silent Safari: Lion
Silent Safari: Ostrich
Silent Safari: Rhinoceros
Silent Safari: Wildebeest
Silent Safari: Zebra
Symbiosis
The Tropical Rain Forest
Weathering And Erosion

## ORGANIZATIONS

The Arbor Society
Audobon Society of Portland
Department of National Parks
•North Luangwa Conservation Project
  P.O. Box 450148
  Mpika, Zambia
Friends of Trees
John Innskeep Environmental Learning Center
METRO Recycling
National Wildlife Federation
Northwest Association of Marine Educators
Northwest Natural Gas
Northwest Steelheaders Association
Oregon Department of Fish and Wildlife
Oregon Department of Environmental Quality
Oregon Museum of Science and Industry (O.M.S.I.)
Portland Bureau of Parks and Recreation
Portland General Electric
•Bonneville Dam
•Trojan Nuclear Facility

Project WILD
•contact Shann Weston
Oregon Dept. of Fish and Wildlife
P.O. Box 59
Portland, OR 97207
(503) 229-5400 ext 427
Sunflower Recycling Cooperative
Waste Management of Oregon
World Forestry Center

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